Volume 15
Number 1
2005

NOVON

Desideria mieheorum (Brassicaceae), a New Species from Tibet

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ABSTRACT. The new Tibetan *Desideria mieheorum* (Brassicaceae) is described and illustrated. It differs from the closely related *D. flabellata* by having slender styles 5–7 mm long, entire stigmas, blue petals, and 10 to 16 ovules per ovary. *Desideria flabellata* has obsolete styles, prominently 2-lobed stigmas, purple petals, and 14 to 24 ovules per locule.

Key words: Brassicaceae, China, *Desideria*, Tibet.

Desideria Pampanini is a genus of 11 species distributed in the Himalayas and adjacent central Asia (Al-Shehbaz, 2001). From its nearest relatives, *Eurycarpus* Botschantzev, *Christolea* Cambessèdes, and *Leiopora* (C. A. Meyer) Dvorák, *Desideria* is easily distinguished by having its fruits rectangular in cross section, dentate leaves, valves with prominent marginal veins, and valve apices persistently united with the replum. A detailed account of these genera is presented in Al-Shehbaz (2001) and is not repeated here. China has eight species (two endemic) in *Desideria* distributed in Qinghai, Tibet (Xizang), and Xinjiang autonomous regions (Zhou et al., 2001).

The new species was discovered among a collection of 52 mustards kindly sent by Georg and Sabine Miehe (University of Marburg, Germany) for determination. It is named in their honor and in recognition of their extensive collections of alpine Tibetan plants.

Desideria mieheorum Al-Shehbaz, sp. nov. TYPE: China. Tibet (Xizang): Chang La, N of Sangsang, 29°41′N, 86°43′E, pioneer on frost debris, 5480–5600 m, 15 Sep. 2003, *Georg & Sabine Miehe 03-112-21* (holotype, MO). Figure 1.

Herba perennis dense pilosa. Folia late obovata vel spathulata, 1.5–3 × 0.7–1.5 cm, dentata. Racemi 5–9-flori; pedicelli fructiferi tenues, 0.8–2.5 cm longi. Sepala oblonga, dense pilosa, 5–6 × 1.5–2 mm; petala caerulea, late spathulata, 10–13 × 3–4 mm; ovula 10–16. Fructus lanceolati vel laneolato-lineari, 1.5–4 cm × 5–8 mm, compressi, dense pilosi; septum completum; stylus 5–7 mm longus, glaber; stigma integrum; semina ovata, 2.5–3 × 1.5–2 mm, biseriata; cotyledones accumbentes.

Perennial herbs 5–15 cm tall, densely pilose throughout; trichomes simple, straight, 1–2 mm long; caudex thick, covered with leaf remains of previous years; stems simple. Leaves basal and cauline, not fleshy; petiole 2–4.5 cm long, pilose; leaf blade broadly obovate to spatulate, 1.5–3 × 0.7–1.5 cm, pilose, base cuneate to attenuate, margins dentate, apex acute. Racemes 5- to 9-flowered, ebracteate; fruiting pedicels slender, ascending, straight to curved, 0.8–2.5 cm long, spreading pilose. Sepals free, oblong, 5–6 × 1.5–2 mm, often persistent to fruit maturity, densely pilose, base not saccate, margins membranous; petals blue, broadly spatulate, 10–13 × 3–4 mm, apex obtuse; claw 6–7 mm long; filaments blue, slightly dilated at base, median pair 5–6 mm long, lateral pair 3–4 mm long; anthers oblong, 1–1.3 mm long; ovules 10 to 16 per ovary. Fruit lanceolate to lanceolate-linear, 1.5–4 cm × 5–8 mm, strongly flattened parallel to septum; valves densely pilose, distinctly veined; septum complete, membranous; style slender, 5–7 mm long, glabrous; stigma entire; seeds dark brown, ovate, 2.5–3 × 1.5–2 mm, biseriate, minutely reticulate; cotyledon accumbent.

Desideria mieheorum is readily distinguished from all species of *Desideria* by its slender styles 5–7 mm long. In the remaining species, the style

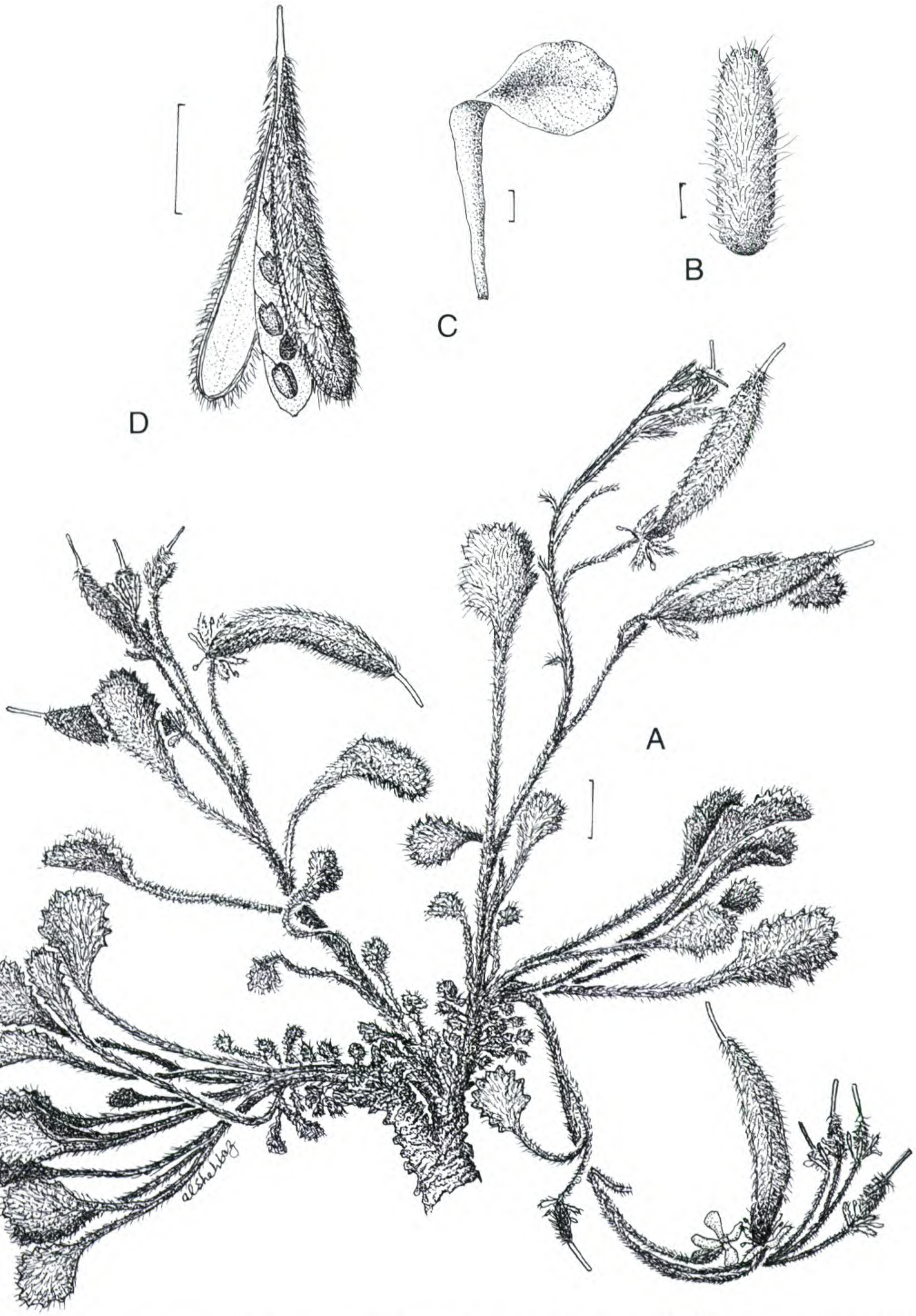

Figure 1. *Desideria mieheorum* Al-Shehbaz. —A. Plant. —B. Sepal. —C. Petal. —D. Dehisced fruit. Scale: A, D = 1 cm; B, C = 1 mm. Drawn by Al-Shehbaz from the holotype (*G. & S. Miehe 03-112-21*, MO).

is obsolete or rarely (as in *D. haranensis* Al-Shehbaz and *D. baiogoinenis* (K. C. Kuan & Z. X. An) Al-Shehbaz) reaches 1 to 1.5 mm in length. The new species is most closely related to *D. flabellata* (Regel) Al-Shehbaz, which it resembles in having similar flower and fruit size, pilose indumentum consisting of long simple trichomes, ebracteate racemes, and leaves obovate to broadly spatulate. It

differs by having slender styles 5–7 mm long, entire stigmas, blue petals, and 10 to 16 ovules per ovary. By contrast, *D. flabellata* has obsolete styles, prominently 2-lobed stigmas, purple petals, and 14 to 24 ovules per locule.

As in all other species of *Desideria*, *D. mieheorum* has fruits that readily detach at maturity from the fruiting pedicels. The fruits have papery valves that readily dehisce at base but remain united with the replum at apex. Therefore, the detached fruit acts as a dispersal unit, and it releases the seeds as it tumbles on the ground.

Acknowledgments. I am most grateful to Georg and Sabine Miehe for sending their Tibetan collections of Brassicaceae for my determinations. I thank Victoria Hollowell and an anonymous reviewer for their critical comments on the manuscript.

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Thirty-Five New Species of *Eugenia* (Myrtaceae) from Mesoamerica

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ABSTRACT. Preparation of a treatment of *Eugenia* (Myrtaceae) for the *Flora Mesoamericana* resulted in the discovery of many taxa heretofore undescribed. Here, 35 new species from all parts of Mesoamerica are described and illustrated: *Eugenia belloi, E. breedlovei, E. cararaensis, E. cerrocaoensis, E. chavarriae, E. cintalapana, E. cocosensis, E. coibensis, E. corusca, E. esteliensis, E. farinacea, E. gomezii, E. grayumii, E. grijalvae, E. hammellii, E. hartshornii, E. herrarae, E. intibucana, E. lempana, E. liesneri, E. lithosperma, E. locuples, E. magniflora, E. mcphersonii, E. molinae, E. monteverdensis, E. paloverdensis, E. quercetorum, E. riosae, E. sancarlosensis, E. selvana, E. shimishito, E. tilarana, E. verruculata,* and *E. zuchowskiae.*

Key words: *Eugenia*, Mesoamerica, Myrtaceae.

The *Flora Mesoamericana* Project has stimulated an increased interest in Central American Myrtaceae. Recent research has resulted in the discovery of one new genus (*Chamguava,* Landrum, 1991) and numerous new species in established genera such as *Mosiera* (Landrum, 1992), *Calyptranthes* and *Myrcia* (Holst, 1999; Holst & Kawasaki, 2004), and *Plinia* (Barrie, 2004).

This paper presents descriptions and illustrations for 35 new species of *Eugenia.* The type collections of the majority, 21, were made in Costa Rica. An additional 6 come from Honduras, 3 from Nicaragua, 2 each from Panama and Chiapas, Mexico, and 1 from El Salvador.

This publication increases to 140 the number of *Eugenia* species known from Mesoamerica. A comprehensive identification key will be published in volume four of *Flora Mesoamericana.*

Eugenia belloi Barrie, sp. nov. TYPE: Costa Rica. Alajuela: Reserva Forestal de Arenal, Quebrada San Gerardo, Río Caño Negro, Finca de Enrique Quesada y Ceferino Gonzáles, 19 Feb. 1990 (fr), *E. Bello 1926* (holotype, INB; isotypes, F, MO). Figure 1.

Eugeniae skutchii aemulans, sed foliis coriaceis, nervis paucioribus et basibus late cuneatis vel rotundatis, floribus majoribus differt.

Trees to 30 m × 20 cm; branchlets, emergent leaves, buds, inflorescences, and young fruits appressed-pubescent with rufous, dibrachiate, and infundibular hairs; branchlets compressed; bark reddish. Leaves elliptic, the blades 8–17 × 3.5–6.5 cm, 1.5–2.5 times as long as wide, coriaceous, drying dark, dull green above, dull, yellowish brown below; midvein impressed above, raised below, tapering distally; lateral veins 12 to 18 per side, plus intermediates, raised on both surfaces; marginal veins similar to the laterals and weakly arched between them, 2–3 mm from the margins; upper surface ultimately glabrate, the midvein persistently and densely pubescent with sordid or cinereous hairs, the lower surface and veins persistently and densely covered with yellow-brown, infundibular hairs; glands on the upper surface numerous and minute or these obscure, glands on the lower surface present but obscured by the vestiture; base broadly cuneate or rounded; margins recurved, often revolute near the base, merging into the inner edge of the petiole; apex acute or acuminate; petioles 10–20 mm long, channeled dorsally, appressed-pubescent. Inflorescences axillary, racemose, solitary; axis 5–10 × 2–3 mm, terete; bracts 1–1.5 × 1 mm, persistent, cymbiform, pubescent on both surfaces, the margins scarious, the apex acute; buds not seen. Flowers pedicellate, the pedicels, bracteoles, hypanthium and calyx uniformly appressed-pubescent; pedicels stout, 7–10 × 2 mm; bracteoles fused into a cymbiform involucre, 3–5 mm diam., pubescent on both surfaces, the margins scarious, the apex rounded; hypanthium globose, 4–5 mm diam., glandular; calyx lobes in subequal pairs, depressed ovate, 4–6 × 4–7 mm, pubescent on both surfaces; petals not seen; disk 4–5 mm diam., pubescent with erect, rufous hairs; stamens ca. 200, 5–6 mm long; style 6 mm long, glabrous. Fruits 30–40 × 30–40 mm, globose; pericarp fleshy, ca. 10 mm thick, the surface verrucose but not costate, uniformly and minutely pubescent,

1

2

Figures 1, 2. —1 (left). *Eugenia belloi* Barrie (*E. Bello 1926*; holotype, INB). —2 (right). *Eugenia breedlovei* Barrie (*Breedlove & R. Thorne 30778*; holotype, DS).

the bracteoles persistent, the involucre separating along the marginal sutures, widely ovate, 2.5 × 5 mm; calyx erect in developing fruit but probably absent at maturity; mature fruit tan.

Habitat, distribution, and phenology. Known from the wet montane forests along the Atlantic slope, Costa Rica, at elevations of 700–1300 m. Collected in flower in December; collected in fruit February–April.

Eugenia belloi is similar to *E. skutchii* C. V. Morton & Standley. Both are large trees with leaves of similar size and overall shape and the underside uniformly covered with persistent, infundibular hairs. However, the leaves of *E. belloi* are coriaceous, with 12 to 18 pairs of lateral veins, plus an indeterminate number of less well-defined intermediate veins and with the base broadly cuneate to rounded. In *E. skutchii*, the leaves are chartaceous, with 16 to 20 well-defined lateral veins and cuneate leaf bases. Moreover, the flowers of *E. skutchii* are smaller; the hypanthium is 2–4 mm long and campanulate rather than globose, and costate rather than unribbed; the opposing pairs of calyx lobes are markedly unequal in size, with the lobes of the smaller pair 2–3 × 2–5 mm and those of the larger pair 3–4 × 4–6 mm; the disk is 3–4 mm in diameter (vs. 4–5 mm in *E. belloi*); and the style, which is glabrous in *E. belloi*, bears a few contorted hairs.

Etymology. Named in honor of Eric Bello, noted authority on the vegetation of the Monteverde region, coauthor of *An Introduction to the Cloud Forest Trees of Monteverde*, and the collector of the type.

Paratypes. COSTA RICA. **Guanacaste:** San Gerardo Abajo, Río Caño Negro, Fincas Quesada y Arce, *E. Bello & E. Cruz 4277* (INB); Tilarán, Cordillera de Tilarán, Palmital, Quebrada Malanga, Río Caño Negro, *E. Bello & E. Cruz 4890* (F, INB, MO); Upper Río Chiquito valley, 5 km N of Santa Elena, Atlantic slope rain forest, *W. A. Haber et al. 4377* (CR, F).

Eugenia breedlovei Barrie, sp. nov. TYPE: Mexico. Chiapas: Barriozábal, 13 km N of Berriozábal near Pozo Turipache & Finca El Suspiro, 25 Dec. 1972 (fr), *D. E. Breedlove & R. Thorne 30778* (holotype, DS; isotypes, F, MEXU, MICH, MO, NY, TEX). Figure 2.

Ab *Eugenia uliginosa* inflorescentiis axillaribus, floribus et fructibus non stipitatis, pedicellis brevioribus differt.

Trees to ca. 10 m tall; branchlets, buds, emergent leaves, and inflorescences minutely puberulent, the hairs ca. 0.1 mm, erect, cinereous; branchlets compressed at nodes; bark gray. Leaves elliptic, the blades 13–23 × 5.5–11 cm, 2–2.8 times as long as wide, coriaceous, drying olive above, lighter green below; midvein flat or weakly convex on the upper surface, elevated on the lower surface; lateral veins 14 to 20, plus intermediates, raised on the upper and lower surfaces, downwardly curved at the midvein; marginal veins straight, 1–2 mm from the margins; upper and lower surfaces glabrate or with a few hairs near the base, the midvein glabrate above, minutely puberulent below; glands obscure on the upper surface, scattered to numerous dark or pellucid glands below; base cuneate; margins revolute; apex bluntly acute; petioles 10–17 mm long, corky, scaly, or fissured transversely, flattened or depressed dorsally, minutely puberulent. Inflorescences cauliflorous, solitary, racemose; axis 1–6 × 2–4 mm, stout, about as wide as long; flowers 6 to 10; bracts 0.5 mm long, persistent, triangular, glabrate in fruit, the margins ciliolate, the apex acute; buds 7–10 mm long, obovoid. Flowers pedicellate but sometimes appearing sessile, the pedicels 1 × 2–3 mm; bracteoles 0.5–1 × 0.5–1 mm, persistent, similar to the bracts, the base free, the margins ciliolate, the apex acute or rounded; hypanthium 3–5 mm, campanulate or urceolate, minutely puberulent; calyx lobes in unequal pairs, the inner and outer surfaces puberulent, the margin ciliolate, the apex rounded, the smaller pair 3–4 × 4–5 mm, the larger pair 4–5 × 5–6 mm; petals not seen; disk 4–5 mm diam., minutely puberulent; stamens 180 to 200, 7–10 mm long; style 14–16 mm long, puberulent. Fruits 18–30 × 18–30 mm, globose or subglobose, constricted apically beneath the persistent calyx; pericarp thick, fleshy, glandular, glabrate or puberulent at the base and apex; immature color yellow-green.

Habitat, distribution, and phenology. Lower montane rain forests, Chiapas, Mexico, at elevations of 500–1000 m. Collected in flower March–May; collected in fruit September–December.

Specimens of *Eugenia breedlovei* have been identified as *E. uliginosa* Lundell, which has leaves half the size of this species, cauliflorous inflorescences, and flowers and fruits with longer pedicels (3–5 mm). In *E. uliginosa*, the base of the hypanthium and of the fruit is elongated to form a stipe 3–4 mm long.

Etymology. The epithet honors Dennis Breedlove, authority on the Chiapan flora and the founding editor of the *Flora de Chiapas*. The type collection is but one of his tens of thousands from the state.

Paratypes. MEXICO. **Chiapas:** Mpio. Ocozocoautla

de Espinosa, just above the community & lake of Malpaso, 45 km N of Ocozocoautla, *D. E. Breedlove 20734* (MICH, MO, NY); 13 km N of Berriozábal, *D. E. Breedlove 21653* (MEXU, MO); mpio. Berriozábal, 13 km N of Berriozábal, near Pozo Turipache & Finca El Suspiro, *D. E. Breedlove 35317* (DS); mpio. Ocozocoautla, 46 km N of Ocozocoautla on road to Mal Paso, *D. E. Breedlove 38285* (MEXU, MO, TEX); mpio. San Fernando, steep slopes with seasonal evergreen forest at the tunnel on the road from Tuxtla Gutíerrez to the Chicoasen Dam, *D. E. Breedlove 40029* (DS), *D. E. Breedlove 41549* (DS); mpio. Ocozocoautla de Espinosa, Cañada La Palma, SE del Cerro el perico 1.5 km, *A. M. A. 9541* (CAS); mpio. Ocozocoautla de Espinosa, El Ocote, Cañada el Palmar, *M. González-Espinosa et al. 1181* (MEXU); Noroeste de San Fernando, *F. Miranda 5244* (MEXU); Encañada de La Chacona a El Aguacate, al Noroeste de Tuxtla Gutierrez, *F. Miranda 6128* (MEXU, MICH); Finca La Chacona (Noroeste Tuxtla Gutierrez), *F. Miranda 6869* (MEXU); mpio. San Fernando, Cañada Muñiz, *G. Rodríguez-Guillén 107* (CAS); mpio. Ocozocoautla de Espinosa, SW side of the Presa de Malpaso, *A. S. Ton 3320* (DS, F, LL, MICH, NY).

Eugenia cararaensis Barrie & Q. Jiménez, sp. nov. TYPE: Costa Rica. Puntarenas: Reserva Biológica Carara, Montañas Jamaica, Sendero a bijagual, 27 Sep. 1990 (fr), *Q. Jiménez 909* (holotype, INB; isotype, F). Figure 3.

Ab *Eugenia truncata* ramulis et foliis glabris, floribus et fructibus minoribus, calycibus pallidis differt.

Trees to 15 m × 20 cm; young shoots apparently minutely puberulent, the hairs ca. 0.2 mm, erect, glabrous otherwise except for the ciliate margins of the bracts and bracteoles and the densely pubescent staminal ring; branchlets terete or compressed; bark tan or brown soon glabrate or with patches of persistent, erect hairs. Leaves elliptic to obovate, the blades 8–20 × 3–8 cm, 2–2.8 times as long as wide, chartaceous, drying a concolorous dull, light green; midvein convex, typically between parallel grooves and ridged above, convex below; lateral veins 10 to 18 per side, plus intermediates; marginal veins similar to the lateral veins, weakly arched, 1–3 mm from the margins; glands numerous and raised above, scattered and dark below; base cuneate; margins somewhat revolute, decurrent into the raised inner edge of the petiole; apex abruptly acuminate or acuminate-apiculate; petioles 4–5 mm long, impressed dorsally. Inflorescences axillary or terminal, solitary, fasciculate or short-racemose, the axis less than 2 mm long; flowers 1 to 10; bracts 0.5 mm, persistent, cymbiform, the margins scarious or scarious-ciliate, otherwise glabrous, the apex acute; buds not seen. Flowers pedicellate, the pedicels 10–40 mm long, gracile, conspicuously glandular; bracteoles 0.5–1 × 0.5–1 mm, persistent, ovate, the base free, the margins scarious or scarious-ciliate, the apex rounded to acute; hypanthium 1.5 mm long, globose; calyx lobes in equal pairs, 2.5–3 × 2.5–3 mm, pale in color with conspicuous dark glands, the apex rounded, the margins entire; petals not seen; disk 2.5–3 mm diam., the staminal ring densely pubescent, the hairs 0.3 mm; stamens ca. 80 to 100, 5–6 mm long; style 5 mm long, glabrous. Fruits 10–20 × 10–20 mm, globose; pericarp thin-walled, conspicuously glandular, glabrous; calyx persistent, erect, pale; mature fruits dark red.

Habitat, distribution, and phenology. Primary forests of the Pacific slope in Costa Rica at elevations of 0–300 m. Collected in flower December–June; collected in fruit August–October.

Eugenia cararaensis is distinguished by the axillary, fasciculate or short-racemose inflorescences with flowers and fruits borne on gracile pedicels 10–40 mm long. The persistent, pale calyx lobes offer a color contrast to the dark red body of the fruit. This species is similar to *E. truncata* O. Berg, a species with hirsute young growth and flowers typically with one or both bracteoles attached 1–5 mm beneath the hypanthium.

Paratypes. COSTA RICA. **Puntarenas:** Palmar Norte, el bosque lluvioso de las montañas bajas cerca de la quebrada Benjamin, al norte del pueblo, *M. Böhlke 595* (CR); PN Corcovado, Carate, Est. La Leona, bosque aledaño, *A. Chacón 990* (INB); Golfito, Jiménez, Alto de Carbonera, camino a Cerro Osa, *G. Herrera 4311* (F, INB); Golfito PN Corcovado, Península de Osa, Sirena, bosque primario, *G. Maass 41* (F, INB); R. F. Golfo Dulce, península de Osa, Rancho Quemado, Finca de Juan Marín, Cerca a Guerra, *J. Marín 83* (F, INB); Osa, Estero Guerra, Sierpe, Fincas que se encuentran al E del Estero, *J. Marín 173* (F, INB); Reserva Biológica Carara, Sector Quebrada Bonita, Sitio Quebrada Bonita, *R. Zuñiga 311* (F, INB). **San Juan:** Reserva Biológica Carara, Sitio Sendero Lalo Barboza, *R. Zuñiga & G. Varela 288* (F, INB).

Eugenia cerrocacaoensis Barrie, sp. nov. TYPE: Costa Rica. Guanacaste: Liberia, Parque Nacional Guanacaste, Cordillera de Guanacaste, Estación de Cacao, 10 Feb. 1995 (fl, fr), *E. Alfaro 92* (holotype, INB; isotypes, CR, F, MO, SEL). Figure 4.

Ab aliis *Eugeniae* costaricensibus foliis brevioribus, ellipticis vel obovatis, coriaceis, floribus pusillis differt.

Small trees or shrubs, to 5 m; young growth glabrous except for the ciliate margins of the bracts, bracteoles, and calyx; branchlets stout, terete; bark gray, fissured horizontally. Leaves elliptic or obovate, the blades 2–5 × 1.5–3 cm, 1.5–2 times as long as wide, coriaceous, drying brown above, tan or olive below; midvein sulcate above, convex below; lateral veins 6 to 8, plus a few intermediates, obscure on both surfaces or prominent below; mar-

Figures 3, 4. —3 (left). *Eugenia cararaensis* Barrie & Q. Jiménez (*Böhlke 595*; paratype, CR). —4 (right). *Eugenia cerrocacaoensis* Barrie (*Alfaro 92*; holotype, INB).

ginal veins similar to the laterals and arched between them, 1–2 mm from the margins; glands obscure above, numerous and dark below; base cuneate; margins revolute, if only on the lower half of the blade, decurrent along the petiole; apex bluntly acute or rounded, the tip ultimately rounded or retuse; petioles 3–4 mm long, flattened dorsally. Inflorescences axillary or cauliflorous, racemose, solitary; axis 1–5(8) mm long; flowers 2 to 8; bracts 0.5–1 mm long, persistent through anthesis, ovate, the margins ciliate, the apex acute; buds 2 mm long, globose. Flowers pedicellate, the pedicels 1–2 mm long, slender in flower, stout in fruit; bracteoles persistent, ovate, fused and forming an involucre 1 mm diam. in bud and flower, reduced and separate in fruit, the margins scarious-ciliolate, the apex rounded; hypanthium 1 mm diam., globose; calyx lobes depressed ovate, in subequal pairs, 0.5 × 1 mm, the margins scarious-ciliolate, the apex rounded; petals not seen; disk 1–1.5 mm diam.; stamens 25 to 40, 3–4 mm long; style 4 mm long, glabrous. Fruits 10–15 × 8–10 mm, ellipsoid to obovoid; pericarp thin-walled, glandular; calyx absent; mature color red.

Habitat, distribution, and phenology. All known collections are from secondary forests on Cerro Cacao, Guanacaste Province, Costa Rica, at 1100 m elevation. Collected in flower in February; collected in fruit February–November.

Eugenia cerrocacaoensis is a distinctive small tree or shrub with stout branchlets, elliptic to obovate, coriaceous leaves with bluntly acute or rounded apices and small flowers, with a globose hypanthium ca. 1 mm in diameter, small, depressed ovate calyx lobes and a disk 1–1.5 mm in diameter, on short pedicels, 1–2 mm long. Vegetatively, *E. cerrocacaoensis* resembles the coriaceous-leaved form of *Siphoneugena dussii* (Krug & Urban) Proença. However, in that species the flowers are borne in fascicles or on a rachis less than 1 mm long, the pedicels are variable in length, up to 6 mm long, and the calyx is fused and poricidal in bud.

Paratypes. COSTA RICA. **Guanacaste:** Liberia, Estación Cacao, PN Guanacaste, *R. Espinoza 55* (CR, INB); PN Guanacaste, Estación Cacao Cordillera de Guanacaste, *F. Quesada 3* (INB).

Eugenia chavarriae Barrie, sp. nov. TYPE: Costa Rica. Guanacaste: Reserva Biológica, Lomas de Barbudal, Valle del Tempisque; Lomas Barbudal, borde de camino al Ref. Rafael Lucas y orilla del R. Cabuyo. Sendero Bagaces, 25 Mar. 1993 (fr), *U. Chavarría 760* (holotype, INB; isotypes, CR, F, MO). Figure 5.

Eugeniae principium aemulans, sed foliis nervis lateralibus obscuris superficialibus, inflorescentiis subsessilibus, fructibus 4–6 mm diametro differt.

Trees to 6 m or more; branchlets terete, puberulent, the hairs 0.2 mm, simple, cinereous, erect or recurved. Leaves elliptic and tapering symmetrically to base and apex or slightly obovate, the blades 2.5–6.5 × 1–3 cm, 2.3–3 times as long as wide, coriaceous, drying dark green above, paler below; midvein concave or flat above, convex below; lateral veins 4 to 6 per side, straight and ascending, obscure above; marginal veins similar to the laterals, straight or weakly arched, 0.5–1 mm from the margins; both surfaces with scattered, erect or recurved hairs, ultimately glabrate; glands small, numerous on both surfaces or obscure above; base cuneate; margins decurrent into the petiole; apex bluntly acute; petioles 2–4 mm long, flattened or concave dorsally, glabrous or pubescent. Inflorescences axillary or cauliflorous, short-racemose, solitary; axis ca. 1 mm long, flowers 1 to 4; bracts 0.5 mm, persistent, elliptic, puberulent, the margins ciliate, the apex acute; buds 3 mm long, obovoid, puberulent. Flowers pedicellate, the pedicels 6–10 mm long, gracile, the pedicels, bracteoles, hypanthium, and calyx puberulent, the hairs 0.2 mm, cinereous, erect or recurved; bracteoles persistent, 0.5–1 mm long, ovate, the base free, the margins ciliate, the apex acuminate; hypanthium 1–1.5 mm diam., globose; calyx lobes in subequal pairs, 0.5–1 × 1 mm, the margins ciliate, the apex acute or acuminate; petals 3–3.5 × 2–2.5 mm, elliptic or ovate, the margins ciliate, the apex rounded; disk 1.5–2 mm diam., puberulent; stamens 30 to 40, 3–4.5 mm long; style 4–5 mm long, glabrous. Fruits 4–6 mm diam., globose; pericarp thin-walled, conspicuously glandular, glabrate or with a few scattered hairs; calyx persistent, inconspicuous; mature color reddish purple.

Habitat, distribution, and phenology. Pacific slope dry forests in northwestern Costa Rica at elevations of 0–800 m. Collected in flower December–January; collected in fruit January–March.

Eugenia chavarriae is distinguished by the leaves with short petioles and elliptic blades tapering symmetrically to the base and apex. The habit and vestiture are similar to *E. principium* McVaugh, a species scattered along the Pacific coast from Colima, Mexico, to Panama. In that species, however, the blades of the leaves, while similar in size, have a cuneate base, an acute or acuminate apex, and persistent, recurved hairs along the margins on the upper surface. The flowers and fruits of both species are similar in size, but in *E. principium* the

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INSTITUTO NACIONAL DE BIODIVERSIDAD
HERBARIO (INB)

HOLOTYPE of
Eugenia chavarriae Barrie

F.R. Barrie Feb 2004
MISSOURI BOTANICAL GARDEN [MO]

FLORA DE COSTA RICA
MYRTACEAE dup.= 6
Eugenia

Det.

GUANACASTE: Cantón de Bagaces.
R. B. Lomas Barbudal
Valle del Tempisque;
Lomas Barbudal, borde de camino al Ref.
Rafael Lucas y orilla del Río Cabuyo.
10°29'45"N 85°22'45"W 100 m
Arbusto de 3 m. Fruto verde y morado
inmaduros. Sendero Bagaces.

Ulises Chavarría 760 31 March 1991

INSTITUTO NACIONAL DE BIODIVERSIDAD
EN COLABORACIÓN CON EL MISSOURI BOTANICAL GARDEN [MO]

6

MISSOURI
BOTANICAL GARDEN
HERBARIUM

Nº 4261401

HOLOTYPE of
Eugenia cintalpana Barrie

F.R. Barrie Feb 2004
MISSOURI BOTANICAL GARDEN [MO]

PLANTS OF CHIAPAS, MEXICO
Schaefferia frutescens Jacq.

Shrub 8 feet tall.
Steep slopes along ravines with Tropical
Deciduous Forest, Zanthoxylum, Guazuma,
Phyllanthus and Agonandra, 5 km west
of Rizo de Oro along Mexican Highway
190. Municipio of Cintalapa de
Figueroa.
Elevation 820 m

D. E. Breedlove 49604 20 January 1981

Figures 5, 6. —5 (left). *Eugenia chavarriae* Barrie (*Chavarría 760*; holotype, INB). —6 (right). *Eugenia cintalapana* Barrie (*Breedlove 49604*; holotype, MO).

calyx lobes are pink at anthesis and persistent and erect on mature fruits.

Etymology. The epithet honors the collector of the type, Ulises Chavarría, a parataxonomist with the Instituto Nacional de Biodiversidad, Costa Rica, a park official at the Parque Nacional Palo Verde, and the coauthor of *Arboles Comunes del Parque Nacional Palo Verde.*

Paratypes. COSTA RICA. **Guanacaste:** Comelco property, near Bagaces, *K. S. Bawa 2054* (MO); OTS research area, Stewart property (28 km N of Cañas), *G. W. Frankie 236* (F, MO); Sta. Rosa NP, 30 km NW of Liberia, *D. H. Janzen 10994* (MO), *D. H. Janzen 11715* (MO), *D. H. Janzen 11759* (MO), *D. H. Janzen 12169* (MO), *D. H. Janzen 12423* (MO); PN Sta. Rosa, 2 km E of park headquarters, *R. Liesner 4233* (CR, MO); Comelco property, near Bagaces, Area E, Transect R2, *P. A. Opler 502* (CR, F); PN Sta. Rosa, *L. J. Poveda 332* (F); Santa Rosa National Park, Siempre Verde, *G. Schofield 76-104* (CR); lower slopes of Volcán Rincón de la Vieja, along R. Colorado, *L. O. Williams et al. 26646* (CAS, CR, F[2]).

Eugenia cintalapana Barrie, sp. nov. TYPE: Mexico. Chiapas: Cintalapa de Figueroa, 5 km W of Rizo de Oro along Mex. Hwy. 190, 20 Jan. 1981 (fr), *D. E. Breedlove 49604* (holotype, MO; isotype, CAS). Figure 6.

Eugeniae avicenniae aemulans, sed indumento tantum simplici, foliis, floribus et fructibus parvioribus differt.

Shrubs to 7 m or more; branchlets and emerging leaves and inflorescences minutely puberulent, the hairs ca. 0.2 mm, erect, or plants glabrous; branchlets terete or flattened at the terminal nodes; bark silvery-gray. Leaves narrowly rhombic or narrowly elliptic, the blades 2.5–4 × 0.5–1 cm, 4–5 times as long as wide, chartaceous, drying a concolorous green; midvein flat or slightly convex on both surfaces, tan in color; lateral veins 5 to 8, barely discernable above, straight and ascending; marginal veins straight, ca. 1 mm from the margins, obscure above; both surfaces glabrate; glands numerous and dark on the upper and lower surfaces; base narrowly cuneate; margins cartilaginous, decurrent into the inner edge of the petiole; apex bluntly acute or rounded; petioles 1–2 mm long, channeled dorsally, glabrate. Inflorescences axillary or cauliflorous, glomerate or short-racemose, solitary or 2 superposed; axis to 1 mm, glabrous or minutely puberulent; flowers 1 to 6; bracts 0.5 mm long, persistent, triangular, glabrate or with a few persistent hairs, the margins entire or ciliate, the apex acute; buds 1.5–2.5 mm, pyriform. Flowers short-pedicellate, the pedicels 1–3 mm long, glabrate or minutely puberulent; bracteoles 0.2–0.5 × 0.2 mm, persistent, triangular, glabrate or with a few persistent hairs, the base free, the margins scarious, the apex acuminate; hypanthium 0.7–1 mm long, campanulate; calyx lobes in subequal pairs, 0.2–0.5 × 0.6–1 mm, depressed ovate, conspicuously white at anthesis, glabrate, the margins entire, the apex rounded; petals 2–2.5 × 1.5–2 mm, elliptic, the margins entire, the apex rounded; disk ca. 1 mm diam., glabrous; stamens 20 to 25, 2 mm long; style 4 mm long, glabrous. Fruits 5–7 × 4–6 mm, globose or subglobose; pericarp thin-walled, rarely obscurely ribbed, prominently glandular, glabrous or with scattered, appressed hairs; calyx persistent, erect; mature color unknown.

Habitat, distribution, and phenology. Known from tropical deciduous forests in eastern Oaxaca and western Chiapas at elevations of 800–1000 m. Collected in flower in October; collected in fruit in January.

Collections of *Eugenia cintalapana* have been identified as *E. avicenniae* Standley, a species of western Oaxaca and Guerrero. That species, however, is much more coarsely pubescent, with flowers and fruits that are nearly twice as large as are found in this species. The flowers of *E. cintalapana* are similar in size to those of *E. capuli* (Schlechtendal & Chamisso) Hooker & Arnott, a species of wetter montane habitats ranging from eastern Mexico to Guatemala, but *E. cintalapana* differs in having bracteoles that are free at the base, rather than connate, and conspicuous, white calyx lobes that contrast with the green hypanthium. In *E. capuli,* as in most *Eugenia,* the calyx and the hypanthium are concolorous.

Paratypes. MEXICO. **Chiapas:** mpio. Cintalapa de Figueroa, 3 km W of Rizo de Oro, *D. E. Breedlove 36751* (DS, MICH) , *D. E. Breedlove & F. Almeda 64899* (CAS, CR, MICH). **Oaxaca:** slopes of Guiengola, *E. J. Alexander 346* (MICH).

Eugenia cocosensis Barrie, sp. nov. TYPE: Costa Rica. Puntarenas: Isla de Cocos, high plateau SE of Chatham Bay, 9–11 Apr. 1979 (fr), *R. Foster 4129* (holotype, CR; isotypes, CAS, F, MO). Figure 7.

Ab *Eugenia pacifica* foliis et floribus paucioribus, fructibus late ellipsoideis vel obovoideis differt.

Small trees or shrubs, 4–5 m; buds, inflorescences, and emergent leaves thinly appressed-pubescent with cinereous or pale coppery, dibrachiate hairs, 0.2 mm long; branchlets compressed; bark reddish, glabrate. Leaves lanceolate or ovate, the blades 3.5–5 × 1–2 cm, 2.5–4 times as long as wide, coriaceous, drying a concolorous olive, the petioles and midveins reddish; midvein impressed above, raised below; lateral veins 4 to 6, straight,

Figures 7, 8. —7 (left). *Eugenia cocosensis* Barrie R. (*Foster 4129*; holotype, CR). —8 (right). *Eugenia coibensis* Barrie (*Dwyer 1639*; holotype, F).

obscure on the upper surface; marginal veins similar to the laterals and arched between them, 1–2 mm from the margins; both surfaces glabrate; glands numerous, conspicuous, usually strongly punctate above, dark below; base cuneate or slightly rounded; margins revolute near the base, decurrent into the inner edge of the petiole; apex acuminate; petioles 2–3 mm long, channeled dorsally, glabrate. Inflorescences axillary, racemose, solitary, appressed-pubescent with pale coppery, dibrachiate hairs; axis 1–3 mm long; flowers 2 to 6; bracts 0.5 mm long, persistent, ovate, the margins scarious, the apex acute; buds 2 mm long, turbinate. Flowers pedicellate, the pedicels 2 mm long, appressed-pubescent; bracteoles fused, forming an involucre 1 mm diam., dilated at anthesis, appressed pubescent on the outer surface only, the margins scarious, the apex rounded; hypanthium 1 mm long, obconic, appressed pubescent; calyx lobes in unequal pairs, 0.5–1 × 1 mm, elliptic, appressed pubescent on the outer surface, the margins scarious-ciliate, the apex rounded; petals 1 × 1 mm, ovate, the margins entire, the apex bluntly acute; disk ca. 1 mm diam., glabrous; stamens 25 to 30, 1 mm long; style 1.5 mm long, glabrous. Fruits 9–10 × 7–8 mm, widely ellipsoid or obovoid; pericarp thin-walled, glabrous, glandular; calyx persistent, erect but inconspicuous; mature color black.

Habitat, distribution, and phenology. Known only from Isla de Cocos, Costa Rica, in wet forests at elevations of 100–500 m. Collected in fruit in April.

Apparently endemic to the Isla de Cocos, *Eugenia cocosensis* is similar to *E. pacifica* Bentham, which is also endemic to the island. This species has leaves with blades half the size of *E. pacifica*, with petioles about one-third as long, 2–3 mm versus 6–10 mm. The flowers of *E. pacifica* are twice the size of those of *E. cocosensis*, and the ellipsoidal fruits are longer, 10–13 mm, and narrower, 4–6 mm.

Paratype. COSTA RICA. **Puntarenas:** Cocos Island, high plateau SE of Chatham Bay, *R. B. Foster 4173* (F, GH, MO).

Eugenia coibensis Barrie, sp. nov. TYPE: Panama. Veraguas: Isla de Coiba, 19 Aug. 1961 (fl), *J. D. Dwyer 1639* (holotype, F; istoype, GH). Figure 8.

Habitu cum *Eugenia rhombea* similis, sed indumento persistenti, pedicellis brevioribus et fructibus grandioribus differt.

Shrubs to 5 m; young growth tomentose with coarsely appressed, simple and dibrachiate hairs, coppery or rufous, becoming olive or gray with age; branchlets terete; bark reddish, with persistent appressed and erect hairs. Leaves ovate, elliptic or obovate, the blades 4–7 × 2–3.5 cm, 2–3 times as long as wide, chartaceous, drying dark green or brown above, gray or olive from the persistent hairs below; midvein sulcate to impressed above, elevated below; lateral veins 5 to 7 per side, often obscure above, slightly raised below; marginal veins similar to the laterals and weakly arched between them, 1–2 mm from the margins; upper surface with the hairs appressed, cinereous, persistent but thinning with age, the lower surface persistently vested with a dense covering of gray or olive dibrachiate and infundibular hairs; glands numerous and minute above, somewhat larger below, visible through the vestiture; base cuneate; margins revolute near the base, decurrent along the inner edge of the petiole; apex acuminate or caudate-acuminate; petioles 5–7 mm long, channeled dorsally, appressed-pubescent. Inflorescences axillary, racemose; solitary or 2 superposed, axis 1–4 mm long, coppery appressed-pubescent; flowers 2 to 6; bracts ca. 0.5 mm long, persistent but reduced in fruit, ovate, vestiture similar to the axis and pedicels in early bud, thinning by anthesis, prominently glandular; buds 2 mm long, obovoid. Flowers pedicellate, the pedicels 3–6 mm long, coppery appressed-pubescent; bracteoles similar to the bracts, persistent, the pair usually fused and forming a well-defined involucre ca. 1 mm diam., dilated at anthesis, appressed-pubescent on the outer surface, the hairs thinning by anthesis, coarsely glandular, the margins ciliolate, the apex acute; hypanthium 1.5 mm long, campanulate, coarsely coppery appressed-pubescent; calyx lobes in markedly unequal pairs, elliptic, appressed-pubescent on both surfaces, the margins ciliate, the apex rounded, the smaller pair 1–1.5 × 1–1.5 mm, the larger 2–2.5 × 2–3 mm; petals 4–4.5 × 3–4 mm, elliptic, the margins ciliate, the apex rounded; disk 2–2.5 mm diam., sparsely pubescent near the style base; stamens ca. 50, 5–6 mm long; style 5–6 mm long, typically with a few scattered hairs. Fruits 6–9 × 6–9 mm, globose or ellipsoid; pericarp thin-walled, glandular, persistently pubescent; calyx persistent, the lobes curled; mature color purple-black.

Habitat, distribution, and phenology. Known only from coastal scrub forest on the Isla de Coiba, off the Pacific coast of Panama, at elevations below 100 m. Collected in flower August–January; collected in fruit October–March.

Eugenia coibensis is distinguished by the persis-

tent pubescence, coppery on young growth but graying with age. The underside of the leaves have a dense covering of dibrachiate and infundibular hairs, much like that of the Costa Rican species *E. lepidota* O. Berg and *E. belloi*. The habit and leaf shape are similar to those of *E. rhombea* (O. Berg) Krug & Urban, a species widely distributed in coastal areas around the Caribbean basin. Unlike *E. coibensis*, *E. rhombea* is glabrous except for scattered, simple hairs on the flower parts and its leaves are rigidly coriaceous.

Paratypes. PANAMA. **Veraguas:** Isla Coiba, desde el Campamento de Las Salinas, 2 km al NO y posteriormente al SSO hacia la cima de Cerro San Juan, *J. Aranda et al. 2196* (F); Montijo, Ensenada Santa Cruz, a lo largo de la costa (derecha a izquierda), *J. Aranda et al. 2469* (US), *A. Espinosa et al. 7831MV* (F); Río Escondido, cerca de la desembocadura, junto al río, *J. Aranda et al. MB1290* (F), *A. Espinosa et al. 527MB* (F); Santa Cruz, camino de el Catival, *S. Castroviejo et al. 7111MV* (F); Punta Cirilo, a 3 km de la desembocadura del río, *S. Castroviejo et al. 13543* (F); playa del río de la Boa, *J. Cuadras et al. 7989MV* (F); borde del río Playa Hermosa, *J. Cuadras et al. 8031MV* (F); ensenada de Santa Cruz, A. Norte de la isla, Orilla de playa en Ensenada Tigrito y Tigrón, *C. Galdames et al. 2156* (F, MO); río Escondido, entre la primera y la segunda cascada, *F. M. Garmandia & M. Velayos 8973MV* (F); Sendero de Sta. Cruz, ca. 500 m de la Estación Biológica, *A. Ibañez et al. 960AI* (F); Isla de Coiba, Río Negro, cauce principal, *A. Ibañez et al. 8915MV* (F).

Eugenia corusca Barrie, sp. nov. TYPE: Costa Rica. Alajuela: San Ramón, Bosque Eterno de los Niños, Cordillera de Tilarán, 5 km W of Chachagua, Quebrada Chachaguita drainage, 17 July 1993 (fr), *W. Haber et al. 11542* (holotype, INB; isotypes, CR, F, MO, SEL). Figure 9.

Ab *Eugenia sarapiquensi* foliis subficialibus coruscis, floribus et fructibus pedicellis differt.

Trees to 10 m; young growth densely appressed-pubescent with coppery, simple hairs, the stems and upper surfaces of the leaves soon glabrate; branchlets compressed; bark gray, smooth. Leaves elliptic or obovate, the blades 7–15 × 2.5–5 cm, 2–3 times as long as wide, chartaceous, drying green above and a glittery, silver-green below; midvein impressed or sulcate above, raised below; lateral veins 5 to 9 per side, curving-ascending, raised on the lower surface, interconnected by numerous, netted veins; marginal veins often poorly defined or obscure above, raised and similar to the laterals below and strongly arched between them, 2–5 mm from the margins; upper surface glabrate, the lower surface persistently covered with a dense mat of minute, simple, colorless or pale coppery hairs, the individual hairs barely distinguishable, producing a reflective, glittery surface; glands on the upper surface numerous and small, glands below obscured by the vestiture; base cuneate or narrowly cuneate; margins decurrent along the petiole; apex acuminate to caudate-acuminate; petioles 5–8 mm long, depressed or sulcate dorsally, glabrate or with a few hairs. Inflorescences axillary or possibly cauliflorous, fasciculate; bracts not seen; buds not seen. Flowers not seen. Fruits 20–25 × 25–40 mm, irregularly obovoid or transversely ellipsoid; pericarp relatively fleshy, glandular-rugose, glabrous; pedicels 4–9 × 2 mm long, sometimes swollen beneath the fruit, the bracteoles less than 0.5 mm, persistent but reduced, triangular, the base free, the apex acute; calyx apparently absent; mature color orange-yellow.

Habitat, distribution, and phenology. Known from wet forests along the Atlantic slope in Costa Rica and Nicaragua at elevations of 100–1000 m. Collected in fruit February–August.

Eugenia corusca is one of a group of Costa Rican species, including *E. sarapiquensis* P. E. Sánchez, *E. grayumii*, and *E. gomezii*, characterized by chartaceous, elliptic or ovate leaves with blades 10–25 cm long and curving ascending lateral veins. In this species, the underside of the leaves is persistently and densely covered with tightly appressed hairs, silvery or grayish green in color, producing a glittery, or coruscate, metallic sheen. In the other Costa Rican species of *Eugenia* in which the undersides of the leaves are persistently pubescent, the vestiture is dull and nonreflective.

Etymology. The epithet refers to the coruscate leaf undersides.

Paratypes. COSTA RICA. **Alajuela:** San Ramón, Los Angeles, Reserva Biológica de San Ramón, Las Rocas, 2 km al Oeste de Finca de Carlos González, *G. Herrera & V. Mora 6876* (CR); Guatuso, Cordillera de Tilarán, 5 km N del Lago Arenal, Cercanías del Lago Coter, Sendero Montaña, Finca Coter-Lago Coter, *J. Sánchez & A. Cascante-M. 396* (CR, F). **Guanacaste:** Tilarán, Zona Protectora Tenorio, Tierras Morenas, Río San Lorenzo, *C. Alvarado 131* (CR[2], INB); Tilarán, Corillera de Tilarán, 1–2 km W of Lago de Cote, 13 km N of Tilarán, Continental Divide on SE slope of Volcán Tenorio, Eco-lodge, *W. Haber & W. Zuchowski 11634* (CR, F, INB); Tilaran ZP Tenorio, Cordillera de Guanacaste, Tierras Morenas, alrededores Río San Lorenzo, *G. Rodríguez 148* (CR, F, INB, MO). **Heredia:** PN Braulio Carillo, Puesto El Ceibo, gently sloping area just above the steep rim of the Río Peje gorge on the W side, along side path that goes from guard house to water supply intake, about 15 minutes uphill, *B. Boyle 1395* (F, INB); Sarapiquí, La Selva Biological Station, beside CC trail at 1200 m, tropical wet forest, on well-drained upland soils, tenth hectare transect LS-2, *B. Boyle 5280* (INB); Sarapiquí, Finca La Selva, Puerto Viejo, leaning over Quebrada Esquina, ca. 2 km upstream from S boundary of La Selva, *G. S. Hartshorn 1315* (CR, F, MO).

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INSTITUTO NACIONAL DE BIODIVERSIDAD
HERBARIO (INB)

HOLOTYPE of:
Eugenia corusca Barrie

F.R. Barrie Feb 2004
MISSOURI BOTANICAL GARDEN (MO)

FLORA DE COSTA RICA

Eugenia

Det

ALAJUELA: Cantón de San Ramón
Bosque Eterno De Los Niños
Cordillera de Tilarán
5 km W of Chachagua
Drainage, Premontane rain forest
Zona Montevera
10°24'00"N 84°39'00"W
Tree, 10 m, fruits
Stream valley, pasture
Dense small bush

William Haber
J. Bradford & D. Stevenson
INSTITUTO NACIONAL DE BIODIVERSIDAD
IN COLLABORATION WITH D. JOHNS, DUKE UNIV.

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MISSOURI
BOTANICAL GARDEN
HERBARIUM

№ 3332171

FIELD MUSEUM OF
NATURAL HISTORY
NEGATIVE NO.
70872

HOLOTYPE of:
Eugenia esteliensis Barrie, sp. nov.

F.R. Barrie Neill 1228
30 Sep 1998
MISSOURI BOTANICAL GARDEN [MO]

Examined for Flora
Of Nicaragua Project

HERBARIO NACIONAL DE COSTA RICA (CR)
Eugenia guatemalensis Donn. Sm.
Identificó: Pablo E. Sánchez Viedas 1986

NICARAGUA
Esteli

Family: MYRTACEAE
Eugenia

Summit of Cerro Quiabu, 1600 m elev. 7 km W of Esteli cloud forest - small remnant of 4-5 hectares. Oreopanax sp. dominant. Canopy height around 10 m.

Tree 7 m.

David Neill 1228 2 Nov. 1976
MISSOURI BOTANICAL GARDEN HERBARIUM (MO)

Figures 9, 10. —9 (left). *Eugenia corusca* Barrie (*Haber et al. 11542*; holotype, INB). —10 (right). *Eugenia esteliensis* Barrie (*Neill 1228*; holotype, MO).

Limón: hills 3.5 km (air) S of Islas Buena Vista on the Río Colorado, 16 km (air) S of Barra del Colorado, *G. Davidse & G. Herrera 31176* (MO). NICARAGUA. **Río San Juan:** Castillo, Reserva Indio-Maíz, a 8 km de la cabecera del Río Bartola, en dirección hacia el Cerro el Diablo, *R. Rueda et al. 5288* (F, MO); Castillo, Reserva Indio-Maiz, Cerro el Diablo, *R. Rueda et al. 5441* (MO); Castillo, Reserva Indio-Maíz, a lo largo del Caño Chontaleño, *R. Rueda et al. 6163* (F, MO).

Eugenia esteliensis Barrie, sp. nov. TYPE: Nicaragua. Estelí: summit of Cerro Quiabu, 7 km W of Estelí, 2 Nov. 1976 (fr), *D. Neill 1228* (holotype, MO; isotypes, MICH, NY). Figure 10.

Ab *Eugenia guatemalensi* foliis angustioribus, indumento cupreo differt.

Trees to 20 m; the young branches, leaves, buds, and inflorescences appressed-pubescent with coppery, dibrachiate hairs; branchlets weakly compressed; bark reddish, glabrate or with some persistent hairs. Leaves elliptic or obovate, the blades 4–7 × 1–2 mm, 3–4 times as long as wide, coriaceous, drying green above, coppery from the appressed hairs below, eventually glabrate and gray; midvein sulcate above, elevated below and tapering distally; lateral veins in 6 to 12 pairs, straight and ascending; marginal veins similar to the lateral veins, straight or weakly arched, ca. 1 mm from the margins; upper surface of mature leaves glabrate or with a few, scattered coppery hairs, the lower surface initially densely coppery, appressed-pubescent, glabrate with age, the hairs commonly patchily deciduous; glands numerous above and below; base narrowly cuneate; margins revolute, somewhat thickened, decurrent into the splayed inner edges of the petiole; apex caudate-acuminate, the acumen 10–15 mm long; petioles 6–12 mm long, channeled. Inflorescences axillary, racemose, solitary or 2 or 3 superposed; axis 8–10 mm long, coppery appressed-pubescent in flower, glabrate in fruit; flowers 5 to 9, a terminal flower usually present; bracts 0.5 mm long, persistent, triangular, coppery appressed-pubescent, the margins ciliate, the apex sharply acute; buds 3–3.5 mm long, obconic, coppery appressed-pubescent. Flowers pedicellate, the pedicels 2–6 mm long; bracteoles 0.3–1 mm long, persistent, triangular, coppery appressed-pubescent, the base free, the margins ciliate, the apex sharply acute; hypanthium ca. 2 mm long, obconic or campanulate, sometimes weakly costate, coppery appressed-pubescent; calyx lobes in markedly unequal pairs, widely ovate, coppery appressed-pubescent on both surfaces, the margins ciliate, the apex rounded, the outer pair 0.7–1.5 × 2 mm, the inner pair 2–2.5 × 2–3 mm; petals 3–3.5 × 2.5–3 mm, widely ovate or elliptic, the margins ciliate, the apex rounded; disk 2.2–2.5 mm diam., with a few erect, coppery hairs at the base of the style; stamens 80 to 100, ca. 5 mm long; style ca. 5 mm long, coppery-pubescent along the lower half. Fruits 6–8 × 6–8 mm, oblate or globose, substipitate; pericarp slightly fleshy, entire or weakly costate; appressed pale, dibrachiate hairs scattered over the surface, concentrated at the base and apex; calyx persistent, erect or curled; mature fruit black.

Habitat, distribution, and phenology. Pine-oak forests and cloud forests, western Nicaragua at elevations of 1100–1600 m. Collected in flower, May–September; collected in fruit October–March.

Eugenia esteliensis is similar to *E. guatemalensis* Donnell Smith, but differs in vestiture color, coppery versus sordid or cinereous, and branchlet color, reddish versus gray. The leaves, though similar in size, are narrower, 3–4 versus 2–3 times as long as wide, while the undersides, ultimately glabrate in this species, retain persistent, scattered hairs in *E. guatemalensis*.

Paratypes. NICARAGUA. **Estelí:** Mesas Moropotente, *G. Davidse et al. 30623* (F, MO); Cerro Quiabú, situado a unos 8 km al NE de la ciudad de Estelí, *A. Grijalva & M. Araquistain 666* (MO); Cerro Quiabú, al NO de Estelí, *P. P. Moreno 1316* (MO); San José de la Laguna, *P. P. Moreno 8095* (MO); al pie del Cerro Quiabú, *P. P. Moreno 8191* (MO); a 8 km de la Carretera Panamerica, camino a San Nicolás, *P. Moreno 8730* (MO); 1.5 km al N del valle San José de la laguna, camino a San Nicolás, *P. Moreno 11331* (MO); 8 km sobre la carretera a San Nicolás, San José de la laguna, *P. Moreno 12677* (MO); faldas del cerro Tisey, *P. P. Moreno 12726b* (MO); La Laguna, 500 m al N del valle, *P. P. Moreno 15755* (MO); 1 km al N de San José de la Laguna, *P. Moreno 16738* (MO); San José de la Laguna, *P. Moreno 17374* (MO); Llano el Pozo, 18 km de Estelí, camino a la Laguna de Miraflores, por Paso de León, *P. P. Moreno 17456* (MO); Cerro Quiabú, *P. P. Moreno 19262* (MO); El Chayote *P. P. Moreno 21767* (MO); Mesas Plan Helado, 25 km al NE de Estelí, *P. P. Moreno 24156* (MO); near Cerro Sta. Rosa de Apaguaji; 7 km NW San Nicolas, Dr. Davila Bolano's farm, *D. Neill 714* (MO[2]); Cerro Quiabú (= Cerro Las Brisas), *W. D. Stevens 16913* (MICH, MO); 11.7–13.7 km NE of Hwy. 1 at Estelí on road to Yalí, Mesas Meroponte, *W. D. Stevens 15693* (MICH, MO); en San José, a 10 km al SE de Estelí, *O. Tellez & P. P. Moreno 4809* (MEXU, MO). **Jinotega:** region of La Montañita & Las Mesitas, in sierra W of Jinotega, *P. C. Standley 10332* (F). **León:** near Estelí border at Finca Quetzal Cayan, ca. 15 km SW of Estelí, *J. T. Atwood & D. A. Neill AN154* (MICH[2], MO). **Madriz:** Carretera a Cusmapa, a 17 km de Somoto, El Silencio, *P. P. Moreno 17627* (MO). **Matagalpa:** Esquipulas, Cerro Santa Maria, 3 km al SE de Esquipulas, *P. P. Moreno 25375* (MO).

Eugenia farinacea Barrie, sp. nov. TYPE: Nicaragua. Matagalpa: El Picacho, E of Sta. María de Ostuma, Cordillera Dariense, 26 May 1974 (fr), *A. Molina R. & A. R. Molina 30513* (holotype, MO; isotype, F). Figure 11.

11

12

Figures 11, 12. —11 (left). *Eugenia farinacea* Barrie (*Molina & Molina 30513*; holotype, MO). —12 (right). *Eugenia gomezii* Barrie (*Gómez et al. 22695*; holotype, CR).

Ab *Eugenia yunckeri* indumento non tantum simplici, foliis nervis lateralibus 10–14, petiolis longioribus, floribus majoribus differt.

Small trees, to 10 m; young stems, petioles, inflorescences densely pubescent with mixture of minute sordid or cinereous, dibrachiate, infundibular and simple hairs; branchlets compressed, ridged; bark tan. Leaves elliptic to obovate, the blades 9.5–16 × 3.5–5.5 cm, 2.5–3.5 times as long as wide, coriaceous, drying dull green above, sordid or cinereous below; midvein depressed between 2 parallel ridges, lateral veins 10 to 14 per side, straight and ascending, marginal veins similar to the laterals and weakly arched between them, 1–2 mm from the margins; upper surface and midvein glabrate or with scattered, dibrachiate hairs, the lower surface densely covered with minute, cinereous or sordid, infundibular and appressed, dibrachiate hairs, ca. 0.1 mm long; glands obscure above, glands dark and scattered below, typically obscured by the vestiture; base cuneate; margin somewhat thickened and revolute; apex acute to acuminate; petioles 10–20 mm long, sulcate dorsally, pubescent with a mixture of appressed, dibrachiate hairs and erect, simple hairs. Inflorescences stout axillary racemes, the axis, bracts, bracteoles, hypanthium, and calyx uniformly coppery-pubescent with a dense covering of appressed, dibrachiate hairs in bud; axis 1–6 × 2–2.5 mm; flowers 4 to 8; bracts 1 × 1 mm, persistent at least through flowering, the margins entire, the apex rounded; buds 5 mm, obovoid. Flowers pedicellate, the pedicels 2–5 × 2–3 mm long, stout, sometimes wider proximally, appressed coppery-pubescent; bracteoles 1–2 × 1.5–2 mm, persistent, sometimes wider than long, appressed-pubescent in bud with coppery or sordid, dibrachiate hairs on the inner and outer surfaces, at anthesis the outer surface glabrate and dark, contrasting with the coppery pedicel and hypanthium, the base free, the margin ciliate, the apex rounded; hypanthium 3–5 mm long, campanulate, densely coppery-pubescent; calyx lobes in subequal pairs, 6–7 × 5–6 mm, elliptic, densely coppery-pubescent on the inner and outer surfaces, at anthesis the outer surface glabrate and dark, the margins ciliolate, the apex rounded; petals 6–8 × 4–6 mm, oblong, the margins ciliate, the apex rounded; disk ca. 5 mm diam., densely coppery-tomentose; stamens ca. 200, 6–7 mm long; style 7–10 mm long, glabrous or with scattered simple hairs on lower half. Fruits 20–40 × 18–35 mm, globose or obovoid, the base slightly attenuate; pericarp 2–3 mm thick on nearly mature fruit, fleshy; the surface verruculate and farinaceous, uniformly covered with minute, sordid or cinereous dibrachiate and simple hairs, 0. 1 mm long; calyx absent; mature color unknown.

Habitat, distribution, and phenology. Wet premontane forests, montane forests, cloud forests in Honduras and Nicaragua at elevations of 1000–1600 m. Collected in flower August–September; collected in fruit September–May.

Along with *Eugenia belloi, E. lepidota,* and *E. hartshornii, E. farinacea* is among a group of species in which the undersides of the leaves are uniformly covered with a persistent, dense mixture of dibrachiate and infundibular hairs. In this species, the fruits are 2–4 cm in diameter, with a fleshy, rugose pericarp. When immature, they are uniformly covered with minute, sordid or cinereous hairs, giving them a farinaceous texture. Whether the vestiture persists in fully mature fruit is unknown. Collections of this species have been identified as *Eugenia yunckeri* Standley, which differs in having generally smaller leaves with half as many lateral veins and shorter petioles (5–9 mm), pedicels less than 2 mm long that are often as wide or wider than long, and globose fruits approximately 2 cm in diameter. In *E. yunckeri,* the vestiture is composed of simple, erect hairs only.

Etymology. The specific epithet refers to the farinaceous fruits.

Paratypes. HONDURAS. **Comayagua:** between San Antoina Siguatepeque & El Cedral, *A. Molina R. 22586* (F, MO[2], NY); El Cedral on Cordillera Montecilos, 16 km SW of Siguatepeque, *A. Molina R. 23319* (F, NY); Camino al Cerro La Carlota, a 2 km de la carretera al Tuma, *P. P. Moreno 15660* (MO). NICARAGUA. **Matagalpa:** El Porvenir, Cordillera Central, *A. Molina R. 20511* (F, NY, US); Finca Sta. María de Ostuma, Cordillera Dariense, *L. O. Williams & A. Molina R. 42646* (F); Fuente Pura, Km 142, carretera Matagalpa–Jinotega, *P. P. Moreno 17057* (MO); Hacienda Sta. María de Ostuma, Cordillera Dariense, *S. Tomlin 84* (MO); Sta. María de Ostuma, Cordillera Central, *L. O. Williams et al. 25063* (F[2], LL, NY, US).

Eugenia gomezii Barrie, sp. nov. TYPE: Costa Rica. Puntarenas: path from Bellavista to Cotoncito, 11 Mar. 1984 (fl), *L. D. Gómez et al. 22695* (holotype, CR; isotypes, CR, MO, TEX). Figure 12.

Eugeniae glandulosopunctatae aemulans, sed foliis petiolis longioribus et apicibus brevioribus, floribus cauliflоris et pedicellatis differt.

Trees to 15 m or more; young growth glabrous or with a few simple hairs on buds and the margins of the bracteoles; branchlets compressed; bark gray, smooth and glandular. Leaves elliptic, the blades 4–8 × 2–4 cm, 1.5–2.5 times as long as wide, chartaceous, drying a concolorous, bright green; mid-

vein flat or concave above, convex below; lateral veins 8 to 10 per side, plus intermediates, prominent on both surfaces; marginal veins similar to the lateral veins and weakly arched between them, 1–3 mm from the margins; glands large, pellucid, prominent on both surfaces and along the midvein; base cuneate; margins entire; apex acuminate, the tip ultimately rounded; petioles 7–10 mm long, sulcate dorsally, prominently glandular. Inflorescences cauliflorous, fasciculate; flowers 2 to 10; bracts 0.3–0.5 mm long, deciduous past anthesis, cymbiform, the margins entire, the apex rounded; buds 2 mm long, obovoid. Flowers pedicellate, the pedicels 3–5 mm long, prominently glandular; bracteoles 1 × 0.5 mm, deciduous after anthesis, ovate, prominently glandular, the base free, the margins scarious with or without a few simple hairs, the apex acuminate; hypanthium 1.5–2 mm long, campanulate, prominently glandular; calyx lobes widely ovate or elliptic, petaloid, white, in unequal pairs, the margins entire, the apex rounded, the smaller pair 1–2 × 1–1.5 mm, the larger 2–3 × 1.5–2.5 mm; petals 2.5–3 × 2–2.5 mm, elliptic, the margins entire, the apex rounded; disk 2–3 mm diam., glabrous; stamens 30 to 50, 3–4 mm long; style 4 mm long, glabrous. Fruits 20–25 × 18–22 mm, broadly ellipsoid or obovoid; pericarp fleshy, 1–2 mm thick, glandular, glabrous; calyx absent; mature color red-purple.

Habitat, distribution, and phenology. Known from the montane forests of western Panama and eastern Costa Rica at elevations of 1000–1800 m. Collected in flower January–April; collected in fruit August–January.

A nearly glabrous, medium-sized tree, *Eugenia gomezii* is similar to *E. glandulosopunctata* P. E. Sánchez & Poveda in having prominent glands on the branchlets, leaves, and inflorescences. The latter species, however, has more prominent leaf apices that are 10–20 mm long and much shorter petioles, 2–3 mm long. They also differ in the position of the inflorescence, axillary in *E. glandulosopunctata*, cauliflorous in *E. gomezi*, the hypanthium in flower, clavate in *E. glandolosopunctata*, campanulate here and in the shape of the fruit, which are longer (20–35 mm) and narrower (10–20 mm) in *E. glandulosopunctata*. *Eugenia siggersii* Standley is another species with similarly shaped, prominently glandular leaves and cauliflorous inflorescences. That species, however, has massive, globose fruits, 3–6 cm in diameter, with a thick, fleshy pericarp.

Etymology. Named for the co-collector of the type, Luis Diego Gómez, noted expert on the flora of Costa Rica and director of the Las Cruces and Finca La Selva biological stations.

Paratypes. COSTA RICA. *C. Laskowski 1442* (CR, F). **Puntarenas:** Osa Aguabuena, oeste, Rincón, *R. Aguilar 1359* (F, INB[2], MO); Coto Brus, Cuenca Terraba-Sierpe, Loma Indio, *E. Alfaro 1881* (F, INB); Coto Brus, Cuenca Terraba-Sierpe, Las Mellizas, Cafrosa, *E. Alfaro 1931* (F, INB); Coto Brus, Cuenca Terraba-Sierpe, Z.P. Las Tablas, Est. Biol. Las Alturas, collectando sobre el carril, *E. Alfaro 2361* (F, INB); Cerro Pando, on road through ridge forest above the Rio Coton & Rio Negro, *K. Barringer & L. D. Gómez 1634* (CR, F, MO); vicinity of first large concrete culvert before Finca Las Alturas at Coton, R. Coton, *T. B. Croat 44369* (MO); Fila El Tigre, SE of Las Alturas, *G. Davidse 24198* (BM, MO); forest along trail betw. Las Alturas & Cotonsito, along R. Cotón, *G. Davidse 24370* (CAS, MO); foothills of the Cordillera de Talamanca, forested valley of the R. Cotón between Sitio Cotón (Cotonsito) & Sitio Tablas, *G. Davidse 24422* (MO); Talamanca along Quebrada Kuisa (tributary of Río Lori) near crossing of Ujarrás-San José Cabécar trail, Cordillera de Talamanca, *M. Grayum 10286* (F); above La Tigra, near Panama border, *D. Hazlett 5048* (F); Osa Palmar Norte, bosque aledaño a la toma de agua potable, faldas de fila Retinto, *Q. Jiménez 1078* (F, INB, MO); Est. Boscosa, Rincón de Osa, 28 Sep. 1991, *L. Martínez s.n.* (INB); Zona Protectora Las Tablas, San Vito Coto Brus–Sabalito Río Negro, *G. Mora 21* (CR, MO); Coto Brus ZP Las Tablas, Cuenca Terraba-Sierpe, sendero Huacas Cotoncito a 2 km E del Cerro Chiva, *E. Navarro V. 716* (F, INB, MO). **San José:** Zona Protectora Las Tablas, R. Cotoncito, *I. A. Chacón et al. 1791* (MO, TEX, WIS). PANAMA. **Chiriquí:** upper small house of Finca Ojo de Agua, E of R. Chevo, *S. Knapp 1542* (MO).

Eugenia grayumii Barrie, sp. nov. TYPE: Costa Rica. Cartágo: Coto Brus, along R. Jaba, 1 km SW of Las Cruces Botanical Garden, 10 Mar. 1987 (fr), *M. Grayum & J. Affolter 8129* (holotype, INB; isotype, MO). Figure 13.

Eugeniae truncatae aemulans, sed foliis basibus cuneatis, petiolatis 6–8 mm, fructibus majoribus, ellipsoidalibus vel obovoideis differt.

Small trees to 15 m; young stems, petioles, and pedicels moderately to densely puberulent, the hairs simple, erect or recurved, 0.1–0.2 mm; branchlets compressed; bark tan or gray. Leaves elliptic, the blades 6–13 × 2–5 cm, 2–2.6 times as long as wide, chartaceous, drying a concolorous olive, the veins a contrasting tan; midvein indented or depressed above, weakly convex below; lateral veins 5 to 6 per side, impressed above or prominent on both surfaces, curving-ascending, with numerous, reticulate intermediate veins; marginal veins well defined, similar to the laterals and arched between them, 2–4 mm from the margins; upper and lower surfaces glabrate or with a few scattered hairs, the margins ciliate, the hairs recurved, 0.1–0.2 mm long, the midvein puberulent or glabrate

13

14

Figures 13, 14. —13 (left). *Eugenia grayumii* Barrie (*Grayum & Affolter 8129*; holotype, INB). —14 (right). *Eugenia grijalvae Barrie* (*Grijalva 324*; holotype, MO).

above and below; glands convex, distributed uniformly over both surfaces; base cuneate; margins entire; apex acuminate; petioles 6–8 mm long, flattened dorsally, puberulent. Inflorescences axillary or cauliflorous, sessile, solitary or 2 superposed; flowers 4 to 10; bracts 0.5 mm long, persistent, triangular, puberulent, the apex acute. Flowers not seen. Fruits 12–15 × 10–12 mm, ovoid; pericarp somewhat fleshy, glandular-verrucose, glabrous or with scattered, minute hairs; pedicels 5–20 mm long, puberulent; bracteoles 0.7–1 × 0.5 mm, elliptic, persistent, opposite or subopposite, one or both adnate or up to 1 mm below the hypanthium, puberulent, the base free, the margins ciliate, the apex acute; calyx persistent, erect, the lobes in subequal pairs, 2–3 × 2–3 mm, triangular, glabrous, the margins ciliate, the apex rounded or bluntly acute; disk 3–4 mm diam., glabrous; mature color red.

Habitat, distribution, and phenology. Known from primary and secondary forests, eastern and central Costa Rica, at elevations of 500–1300 m. Collected in fruit January, March, September, December.

Eugenia grayumii is one of three species (the other two are *E. truncata* O. Berg of Costa Rica and *E. jutiapensis* Standley & Steyermark of eastern Guatemala and El Salvador) in which the bracteoles of many of the flowers are not paired and opposite each other immediately beneath the hypanthium as is typical in *Eugenia*, but which are instead offset, attached singularly and remotely at different points along the pedicel. This species differs from *E. truncata* in having leaves with cuneate, rather than truncate or abruptly cordate, bases and longer petioles, 6–8 mm versus 2–3 mm. The pedicels are typically longer, 15–22 mm, and more gracile in *E. truncata* than in *E. grayumii*, where they are usually between 5 and 15 mm long, but in the latter species individual flowers or fruits may have pedicels up to 20 mm long.

Etymology. The epithet honors the collector of the type, Michael Grayum, noted authority on Araceae and co-editor of the *Manual de Plantas de Costa Rica.*

Paratypes. COSTA RICA. **Cartago:** Coto Brus, Slopes of Cerro Paraguas, *P. Aldrich 93044* (CR); ca. 17 km N of San Vito on dirt road to Potrero Grande, *C. Davidson 7161* (F, MICH, MO); Caña Gordas Las Cruces Botanical Garden, *G. S. Hartshorn 2155* (CR[2], F, MO, NY); Turrialba, Monumento Nacional Guayabo, camino arriba de la cada de la Administración, *G. Rivera et al. 1968* (CR, F, K, MO[2]). **San José:** Reserva Biológica Carara Bijagual, *B. Hammel et al. 17708* (F, K[2]); Turrubares, RB Carara, Valle del Táracoles, Sector Bijugal, bordes del bosque 2° en el límite de la Reserva, *Q. Jiménez & V. H. Ramírez 1722* (F, INB, MO).

Eugenia grijalvae Barrie, sp. nov. TYPE: Nicaragua. Atlántico Norte: Cerro El Hormiguero, 14 Apr. 1979 (fr), *A. Grijalva 324* (holotype, MO; isotype, MICH). Figure 14.

Ab aliis *Eugeniae* nicaraguensibus indumento coffeato et foliis lanceolatis vel anguste ellipticis differt.

Trees to 10 m or more; young stems, leaves, and inflorescences densely appressed-pubescent, the hairs dibrachiate, coffee-brown; branchlets terete; bark brown, persistently pubescent. Leaves narrowly elliptic or lanceolate, the blades 7–12 × 1.5–2.5 cm, 4–7 times as long as wide, coriaceous, drying dark green above, coffee-brown from the persistent hairs below; midvein flat or concave between 2 parallel ridges above, convex below; lateral veins 12 to 18 per side, plus intermediates, prominent on both surfaces, though somewhat obscured by the vestiture below; marginal veins similar to the laterals and weakly arched between them, ca. 1 mm from the margins; upper surface glabrate or with a few, scattered hairs, the lower surface persistently covered with a dense mat of appressed, coffee-colored hairs; glands on the upper surface a mixture of large, raised glands and, on mature leaves, numerous minute, punctate glands on the lower surface typically obscured by the vestiture; base narrowly cuneate; margins revolute, abruptly merging into the inner edge of the petiole; apex acuminate to caudate-acuminate, the acumen straight to falcate; petioles 9–10 mm long, channeled dorsally, thinly appressed-pubescent. Inflorescences axillary, racemose, solitary, all parts appressed pubescent; axis 3–5 × 1–2 mm; flowers 4 or more; bracts 1 mm long, persistent or deciduous, cymbiform, pubescent on both surfaces, the margin entire, the apex acute; buds not seen. Flowers not seen, apparently large, pedicellate, the pedicels 4–5 mm long, the bracteoles 1–2 × 2–3 mm, persistent, widely ovate, pubescent on the inner and outer surfaces, the base free, the margins entire, the apex rounded, the hypanthium and calyx densely appressed-pubescent, the disk ca. 5 mm diam., stamens ca. 130 to 150. Fruits 20–30 × 20–30 mm, globose; pericarp fleshy, at least 2–4 mm thick, glandular and at times weakly costate, persistently appressed-pubescent; calyx persistent, erect, the lobes 2–3 × 3–4 mm, convex, widely ovate, appressed-pubescent on the inner and outer surfaces; immature color coffee-brown from the vestiture, mature color unknown.

Habitat, distribution, and phenology. Known

only from cloud forests in central Nicaragua at elevations of 800–1200 m. Collected in fruit in April.

The distinctive, coffee-brown vestiture and narrowly elliptic or lanceolate leaves distinguish this species from all others in Nicaragua. The persistently pubescent undersides of the leaves lighten with age, as though a bit of cream had been added.

Etymology. The epithet honors the collector of the type, Alfredo Grijalva, curator of the Herbario Nacional de Nicaragua.

Paratypes. NICARAGUA. **Matagalpa:** Cerro El Hormiguero, western range, *J. Pipoly 5175* (MICH, MO). **Zelaya:** Cerro La Pimienta numbers 1 & 2, eastern range, summit of 2 peaks, northernmost and central, *J. Pipoly 5255* (MICH, MO).

Eugenia hammelii Barrie, sp. nov. TYPE: Costa Rica. Puntarenas: Golfito, R. F. Golfo Dulce, Osa Península, Rancho Quemado, ca. 15 km Oeste de Rincón, en borde de bosque en fila antes de llegar a Rancho, 6 May 1992 (b, fl, fr), *B. Hammel, G. Galeano & A. Henderson 18505* (holotype, INB; isotypes, F, MO). Figure 15.

Eugeniae glandulosopunctatae aemulans, sed indumento sericeo, inflorescentiis racemosis, hypanthiis urceolatis et calycibus lobis anguste ellipticis differt.

Trees to 25 m; young stems sericeous, the hairs 0.5 mm, simple, white; branchlets terete or compressed at the nodes; bark gray, flaking. Leaves elliptic, the blades 4–9 × 2–3 cm, 2–3 times as long as wide, chartaceous, drying concolorous or brown-olive above, pale green or tan below; midvein sulcate above, convex below; lateral veins 7 to 10 per side, plus intermediates; marginal veins similar to the laterals and arched between them, 1–2 mm from the margins; both surfaces of young leaves thinly pubescent with pale, appressed, silky hairs, glabrate at maturity; glands on the upper surface obscure, the lower surface with a few, scattered pellucid glands; base cuneate; margins revolute, decurrent along the inner edge of the petiole; apex acuminate, the ultimate tip blunt or rounded; petioles 5–7 mm long, sulcate dorsally, with appressed hairs, similar to those of the stems. Inflorescences axillary, of single flowers or more commonly racemose, solitary, the pedicels, bracts, and buds thinly pubescent, the hairs 0.5 mm long, white, simple, appressed; axis 10–30 × 1 mm, terete; flowers 1 to 6; bracts 1–1.5 × 1 mm, present at anthesis, cymbiform, the margins ciliate, the apex acute; buds 5 mm long, obovoid. Flowers pedicellate, the pedicels 4–12 mm long, thinly pubescent, the hairs white, appressed; bracteoles ca. 2 × 0.5 mm, deciduous prior to anthesis, narrowly elliptic, thinly pubescent on inner and outer surfaces, the base free, the margins ciliate, the apex acute; hypanthium 2–2.5 mm long, narrowly urceolate, sericeous, the base attenuate; calyx lobes in unequal pairs, narrowly elliptic, connate near the base, thinly pubescent on inner and outer surfaces, the margins entire, the apex rounded, the smaller pair ca. 2.5 × 1 mm, the larger pair ca. 5 × 1 mm; disk 2–2.5 mm diam., glabrous or with a few, scattered hairs; stamens 50 to 60, 6–6.5 mm long; style 6–7 mm long, glabrous or with a few, scattered hairs. Fruits 20–25 × 10–14 mm, ellipsoid or ovoid; pericarp moderately fleshy, glandular, glabrous; calyx persistent, the lobes spreading; mature color yellow-orange.

Habitat, distribution, and phenology. Primary forests, central Costa Rica to western Panama at elevations of 200–500 m. Collected in flower March–December; collected in fruit September–June.

Eugenia hammelii is distinguished most readily from other Costa Rican *Eugenia* by flower characters: the narrowly urceolate hypanthium and the narrowly elliptic calyx lobes, in unequal pairs, which persist on the maturing fruit. In bud, the larger lobes are straight and extend well beyond the unopened corolla. Herbarium collections might be confused with *E. glandulosopunctata*, a small tree of the Atlantic slope, which has branchlets and leaves of similar shape and texture. The two differ, however in vestiture; *E. glandulosopunctata* is glabrous except for the margins of the bracts and the flower parts, while the young growth of *E. hammelii* is thinly sericeous. The two species differ in several floral characters, also. In *E. glandulosopuntacta* the bracteoles are triangular, about 0.5 mm long and persistent; the hypanthium is clavate and covered with numerous, prominent glands; the calyx lobes are 1.2–2 mm long, ovate, with a rounded apex. The flowers of *E. hammelii* have elliptic bracteoles ca. 2 mm long that are deciduous prior to anthesis, a narrowly urecolate hypanthium that is sericeous with white hairs and the distinctive, narrowly elliptic calyx lobes.

Etymology. The epithet honors Barry Hammel, noted expert on the Costa Rican flora and co-editor of the *Manual de Plantas de Costa Rica.*

Paratypes. COSTA RICA. **Heredia:** Chilamate de Sarapiquí, S end of Cerros Sardinal, on hills S side of R. Sarapiquí, *B. Hammel et al. 14136* (MO, TEX); Sarapiquí, Finca La Selva, Puerto Viejo, squatter clearing near SW corner, *G. S. Hartshorn 1353* (CR, MO); Sarapiquí, Finca La Selva, Puerto Viejo, Vargas clearing near W boundary, *G. S. Hartshorn 1598* (CR, MO). **Puntarenas:** Osa, R.F.

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HOLOTYPE of
Eugenia hammelii Barrie

F.R. Barrie Feb 2004
MISSOURI BOTANICAL GARDEN [MO]

INSTITUTO NACIONAL DE BIODIVERSIDAD
HERBARIO (INB)

FLORA DE COSTA RICA

MYRTACEAE dup.# 9

Eugenia

Det.

PUNTARENAS: Reserva Forestal Golfo Dulce Osa Peninsula, Rancho Quemado, ca. 15 km Oeste de Rincón; en borde de bosque en fila antes de llegar a Rancho.
8°42'N 83°33'W 250 m
Arbol 8 m; flores blancos volveindose amarillos (los filamentos); frutos amarillo-anaranjado. (Madera mucho mas suave & quebradiza que cualquier otro de la familia que he colectado.)

Barry Hammel 18505 5 June 1991
Gloria Galeano & Andrew Henderson
INSTITUTO NACIONAL DE BIODIVERSIDAD
EN COLABORACION CON EL MISSOURI BOTANICAL GARDEN (MO)

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MISSOURI
BOTANICAL GARDEN
HERBARIUM

№ 2323063

HOLOTYPE of
Eugenia hartshornii Barrie

F.R. Barrie Feb 2004
MISSOURI BOTANICAL GARDEN [MO]

Eugenia octopleura Kr.& Urb.

Determined by Ronald L. Liesner 1975
Missouri Botanical Garden

PLANTS OF COSTA RICA

Family: Myrtaceae

MYRCIA CARNEA DC.

Common name: "Canilla de mula"
Tree, about 25 cm dbh

Holdridge Arboretum tag #185

Finca La Selva, 10° 26' N, 84° 01' W, Puerto Viejo, Sarapiquí, Heredia Province.

Gary S. Hartshorn 1249 Date: 29 June 1973

ORGANIZATION FOR TROPICAL STUDIES

Figures 15, 16. —15 (left). *Eugenia hammelii* Barrie (*Hammel 18505*; holotype, INB). —16 (right). *Eugenia hartshornii* Barrie (*Hartshorn 1249*; holotype, MO).

Golfo Dulce, Península de Osa, Agaubuena, sector oeste, *R. Aguilar 694* (INB); Golfito, R.F. Golfo Dulce, Serranias de Golfito, Sendero San Josecito, *R. Aguilar 5121* (INB, MO); Golfito, R.F. Golfo Dulce, Península de Osa, Puerto Jimenez, *R. Aguilar 5156* (INB, MO); Golfito, R.F. Golfo Dulce, Península de Osa, Estación Agujas, Río Agujas, Sendero Bonanza, *A. Azofeifa 368* (INB); Puerto Cortéz, Palmar Norte, Quebrada Benjamin, Subiendo Fila Retinto, *G. Herrera 6773* (F); Osa, R.F. Golfo Dulce, Peninsula de Osa, Rancho Quemado, Fila Guerra, Rincón, *M. Segura 17* (CR, F, INB, MO). PANAMA. **Bocas del Toro:** siguiendo el camino que va a Quebrada Bonyic, *D. Santamaría & B. Lara 1103* (MO).

Eugenia hartshornii Barrie, sp. nov. TYPE: Costa Rica. Heredia: Sarapiquí, Finca La Selva, Puerto Viejo, 29 June 1973 (fl), *G. Hartshorn 1249* (holotype, MO; isotypes, CR, F, NY). Figure 16.

Eugeniae skutchii aemulans, sed floribus paucioribus, fructibus ellipsoidalibus differt.

Small trees, to 5 m or more; branchlets, buds, and inflorescences densely appressed-pubescent with ochraceous, dibrachiate hairs; branchlets terete or weakly 4-angled; bark fissured, persistently pubescent. Leaves elliptic or obovate, the blades 13–20 × 6–8 cm, 2.3–2.8 times as long as wide, chartaceous, drying a concolorous light to dark olive, or paler below; midvein impressed above, elevated below; lateral veins 16 to 18 per side, plus intermediates, prominent on the lower surface; marginal veins similar to the laterals and weakly arched between them, 2–3 mm from the margins; upper surface ultimately glabrate or with a few scattered hairs, the midvein persistently pubescent, the lower surface densely and uniformly covered with ochraceous infundibular hairs; glands on the upper surface numerous, minute, raised, the glands on the lower surface larger, typically obscured by the vestiture; base cuneate; margins merging into the inner edge of the petiole; apex acuminate; petioles 5–6 mm long, sulcate dorsally, persistently appressed-pubescent. Inflorescences axillary, racemose, solitary, the axis, bracts, and buds persistently appressed-pubescent with coppery, dibrachiate hairs; axis 5–10 × 1–1.5 mm, 4-angled; flowers 4 to 8; bracts 1.5 mm long, persistent, cymbiform, pubescent on both surfaces, the margins scarious, the apex rounded; buds 4 mm long, obovoid. Flowers pedicellate, the pedicels 5–10 mm long, the vestiture of the pedicels, involucre, hypanthium, and calyx similar to that of the axis; bracteoles fused, forming an involucre 2 × 1 mm diam., dilated in bud and flower, pubescent on both surfaces, the margins scarious, the apex acute; hypanthium 2 mm long, campanulate, costate; calyx lobes rounded or ovate, in unequal pairs, densely pubescent on both surfaces, the margins ciliate, the apex rounded, the outer pair 2 × 2–3 mm, the inner pair 3–4 × 3 mm; petals 5 × 3 mm, obovate, the margins ciliate, the apex rounded or bluntly acute; disk 3–3.5 mm diam., bearing erect, minute, coppery hairs; stamens 80 to 100, 4–5 mm long; style 7 mm long, with a few, contorted hairs. Mature fruits not seen; immature fruits ca. 15 × 10 mm, ellipsoid; pericarp fleshy, rugose, uniformly pubescent.

Habitat, distribution, and phenology. Lowland forests and premontane wet forests along the Atlantic slope, Costa Rica, at elevations of 0–300 m. Collected in flower in June; collected in fruit in January and March.

Collections of *Eugenia hartshornii* are very similar to those of *E. skutchii*, a species of the montane forests at elevations of 1000–1800 m. While *E. hartshornii* has much shorter petioles, 5–6 mm versus 10–20 mm, the leaf blades of the two species are of similar size and shape, with the underside densely and persistently covered with infundibular hairs. The inflorescences are similar, although in *E. skutchii* they are typically longer, with an axis up to 25 mm long. The flowers in *E. hartshornii* are rather smaller; the hypanthium is 2 mm long, versus 2–4 mm as in *E. skutchii*, and the larger set of calyx lobes in the latter species are often much broader than long, 3–4 mm long by 3–6 mm wide. In both species, flowers and fruits are subtended by a prominent, dilated involucre formed by the fused bracteoles.

Etymology. The epithet honors the collector of the type, Gary Hartshorn, the CEO of the Organization for Tropical Studies and a noted authority on the ecology of Costa Rica.

Paratypes. COSTA RICA. **Heredia:** Orilla del R. Guacimito, Magsaysay, *I. A. Chacón 152* (CR, MO); Center Arboretum, Finca La Selva, Puerto Viejo, *G. W. Frankie 188* (F, MO); Sarapiquí, Llanura de San Carlos, La Virgen, *N. Zamora et al. 2527* (INB). **Limón:** Hacienda Tapezco-Hda. La Suerte, 29 air km W of Tortuguero, *C. Davidson et al. 6905* (MO); Pueblo Nuevo, 17 km NE of Guácimo, on the farm of Bernardo Herrera M., *K. Thomsen 1017* (CR).

Eugenia herrerae Barrie, sp. nov. TYPE: Costa Rica. Limón: Guápiles Los Angeles, 24 Feb. 1990 (b, fl), *G. Herrera & S. Schik 3790* (holotype, CR; isotypes, F, K, MO). Figure 17.

Ab *Eugenia siggersii* foliis majoribus, petiolis rubris et floribus majoribus differt.

Trees to 10 m or more; young growth reddish, glabrous or with a few scattered simple hairs, all

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Figures 17, 18. —17 (left). *Eugenia herrerae* Barrie (*Herrera & Schik 3790*; holotype, CR). —18 (right). *Eugenia intibucana* Barrie (*Molina R. 22596*; holotype, MO).

parts ultimately glabrate except for the ciliate margins of the bracts, bracteoles, calyx lobes, and petals; branchlets terete; bark reddish. Leaves narrowly elliptic or narrowly oblanceolate to elliptic or obovate, the blades 12–16 × 3–7 cm, 2–4 times as long as wide, coriaceous, drying a concolorous olive; midvein incised above, elevated below; lateral veins 10 to 12, curving-ascending, raised on the lower surface; marginal veins similar to the lateral veins, straight, ca. 1 mm from the margins; glands on both surfaces pellucid, prominent and raised; base narrowly cuneate; margins revolute near the base, decurrent into the inner edge of the petiole; apex abruptly acuminate; petioles 6–9 mm long, reddish, sulcate dorsally. Inflorescences cauliflorous, fasciculate; flowers 4 to 10; bracts 0.5 mm, scaly, the margins scarious, the apex acute or rounded; buds 5–7 mm, globose. Flowers pedicellate, the pedicels 8–12 mm, prominently glandular; bracteoles fused, forming an involucre ca. 1 mm across, the margins scarious, with a few, minute hairs, the apex acute; hypanthium 2–3 mm long, obconic; calyx lobes in unequal pairs, depressed ovate, the margins ciliolate, the apex rounded, the outer pair 2–3.5 × 3.5–4 mm, the inner pair 4–5.5 × 4–5 mm; petals 5–6 × 4–5 mm, elliptic or ovate, the margins ciliate, the apex rounded; disk 4–4.5 mm diam., the staminal ring ciliate; stamens 90 to 100, 5–7.5 mm long; style 8–9 mm long, glabrous. Fruits 35 × 35 mm, globose; pericarp fleshy, ca. 5 mm thick, prominently glandular; calyx persistent, erect; immature color yellow, mature color unknown.

Habitat, distribution, and phenology. Montane forests along the Atlantic slope of western Panama and eastern Costa Rica at elevations of 700–1200 m. Collected in flower in February–March; collected in fruit in September–October.

Eugenia herrerae is distinguished by its red new growth, the large, elliptic leaves with reddish petioles and abruptly acuminate apices, the cauliflorous flowers with involucrate bracteoles, and the globose fruits with a thick and fleshy pericarp. *Eugenia siggersii* has similar, though often larger, fruits but differs in having leaves with shorter blades (5.5–12 cm) that dry a bright green, with green petioles and more prominent veins and glands, and flowers with the bracteoles free at the base.

Etymology. The epithet honors the collector of the type, Gerardo Herrera, who has contributed many valued specimens of Costa Rican plants, among them numerous previously undescribed species.

Paratype. PANAMA. **Veraguas:** N of Sta. Fe, ca. 2 km N of Escuela Agrícola Alto de Piedra, *S. Mori & J. Kallunki 2617* (F, MO).

Eugenia intibucana Barrie, sp. nov. TYPE: Honduras. Intibucá: vicinity of Mazaguara, Valley de Jesús de Otoro, 3 Sep. 1968 (b, fl), *A. Molina R. 22596* (holotype, MO; isotypes, BM, DS, F, NY). Figure 18.

Ab *Eugenia hypargyrea* foliis plus nervis lateralibus et petiolis duplo longioribus, inflorescentiis longioribus differt.

Shrubs or small trees to 8 m; stems, young leaves, inflorescences densely covered with appressed, reddish, dibrachiate hairs, the hairs paling with age; branchlets compressed, weakly channeled; bark gray, pubescent with appressed, reddish hairs. Leaves obovate to elliptic, the blades 7–12 × 4–6 cm, 1.5–3 times as long as wide, coriaceous, drying a bright green above, yellow or white below from the dense mat of appressed hairs; midvein concave above, convex below; lateral veins 6 to 10 per side, straight and ascending; marginal veins strongly arched, 3–4 mm from the margins; upper surface pubescent with a mixture of simple and dibrachiate hairs, the lower surface covered with a dense mat of tightly appressed, white or sordid hairs; glands obscure on the upper surface, typically obscured by vestiture on the lower surface; base acute or cuneate; margins revolute; apex bluntly acute or rounded; petioles 10–17 mm long, terete, densely appressed-pubescent, the hairs sordid. Inflorescence axillary, racemose, solitary or 2 or 3 superposed, the axis, bracts, and buds uniformly appressed-pubescent with reddish, dibrachiate hairs; axis 10–25 mm long; flowers 4 to 10; bracts 1–2 × 1 mm, persistent at least through flowering, triangular, the apex acute; buds 4–6 mm long, obovoid. Flowers pedicellate, the pedicels 4–8 mm, reddish appressed-pubescent; bracteoles 0.7–1.5 × 0.5–0.7 mm, persistent, triangular, initially appressed-pubescent, the hairs thinning, exposing the prominent black glands, the bracteoles then contrasting with the pedicel and hypanthium, the base free, the apex acuminate; hypanthium 1.5–2.5 mm long, obconic, weakly costate, calyx lobes in markedly unequal pairs, reddish appressed-pubescent on the inner and outer surfaces, the margin ciliate, the apex rounded, the smaller pair 1.5–2 × 2.5 mm, the larger pair 3–4 × 3.5–4 mm; disk 3–4 mm, the staminal ring tufted-ciliate; stamens 130 to 160, 5–6 mm long; style 7–9 mm long, scattered, simple hairs along the lower third. Fruits not seen.

Habitat, distribution, and phenology. Endemic

to the pine-oak forests of central Honduras, 600–1500 m. Collected in flower August–February.

Most of the specimens cited under *Eugenia intibucana* were originally identified as *E. hypargyrea* Standley, apparently on the basis of general leaf shape and similar vestiture. However, a suite of characters distinguish the two. The leaves of *E. intibucana* have more lateral veins (6 to 10 per side vs. 5 to 7) and longer petioles (10–17 vs. 5–10 mm). While in both species the undersides of the leaves are covered with a dense mat of appressed, dibrachiate hairs, in *E. hypargyrea* the upper side is glabrate except for a few hairs near the base of the blade, while in *E. intibucana* it is persistently pubescent. The inflorescence axis is longer in this species, 10–25 mm versus 5–10 mm. The hypanthium, calyx, and staminal disk are similar in size in both species, but *E. intibucana* has longer (5–6 vs. 4–4.5 mm), more numerous stamens (130 to 160 vs. 85 to 100) and a longer style (7–9 vs. 6–7 mm) that is pubescent along its lower third, not wholly glabrous.

Paratypes. HONDURAS. **Choluteca:** vicinty of San Marcos de Colón, *P. C. Standley 15926* (F). **Comayagua:** near El Negrito, Comayagua Valley, *D. Hazlett s.n.* (MO); La Piramide, betw. Comayagua & F. Morazón border, *A. Molina R. & A. R. Molina 22716* (BM, DS, F, NY). **Copán:** 2 km N of Sta. Rosa de Copan, *D. Hazlett 762* (MO); along El Higuerito R., 6 km from San Juan Opoa, *A. Molina R. & A. R. Molina 31122* (F, MO). **Lempira:** Matorrales de Quebrada Bañaderos cerca de Lepaera, *A. Molina R. 12995* (F[2], NY). **Francisco Morazán:** Orillas del R. Jalán, a 12 km al O de Guaimaca, *A. Molina R. 2930* (F, GH); edge of R. Guacerique betw. Los Laureles & Las Tapias, NW of Tegucigalpa, *A. Molina R. 18596* (F, GH, NY); along Amarateca creek, Amarateca valley between Zambrano & Amarateca, *A. Molina R. 22648* (F, MO, NY); rocky roadside hills of Támara Valley, vicinity of R. de El Hombre, *A. Molina R. & A. R. Molina 24542* (F, NY); along road betw. Tegucigalpa & Puente Colorado, near Choluteca R. on way to Talanga, *A. Molina R. & A. R. Molina 25829* (BM, F, MO, NY). **Santa Bárbara:** 4 km NE of La Arada, *W. E. Harmon & J. D. Dwyer 3819* (MO).

Eugenia lempana Barrie, sp. nov. TYPE: Honduras. Ocotepeque: thickets of the Lempa River, road to Esquipulas, 29 Aug. 1968 (fr), *A. Molina R. 22427* (holotype, F; isotypes, BM, GH, NY[2]). Figure 19.

Eugeniae guatemalensi aemulans, sed ramulis grosse tomentosis, mox glabratis, foliis glabratis, floribus bracteolis caducis differt.

Trees to 5 m; young growth coarsely tomentose with coppery, contorted, dibrachiate hairs; branchlets terete or somewhat compressed, soon glabrate or nearly so; bark initially reddish, then white or gray. Leaves narrowly elliptic to narrowly obovate, the blades 3–7 × 1–3 cm, 2–4 times as long as wide, coriaceous, drying concolorous or slightly paler green below; midvein sulcate above, convex below; lateral veins 10 to 14 per side, straight and ascending, prominent below; marginal veins similar to the laterals and arched between them, 1–2 mm from the margins; upper surface soon glabrate or with a few, scattered hairs near the base, the lower surface more persistently pubescent with coppery, contorted hairs, ultimately glabrate; glands numerous, small and convex on both surfaces; base cuneate; margins cartilaginous, weakly revolute; apex bluntly acute to acuminate, the tip rounded; petioles 5–7 mm long, sulcate dorsally, persistently appressed-pubescent, glandular. Inflorescences axillary, racemose, solitary or 2 superposed; axis 5–15 mm long, coarsely coppery tomentose; flowers to 11, a terminal flower often present; bracts 1–1.5 mm long, deciduous soon after anthesis, ovate, glabrate and prominently glandular, the base clasping, the margins scarious, the apex acute; buds 3 mm long, obovoid. Flowers pedicellate or the terminal flower sessile, the pedicels 2–5 mm long, terete or weakly 4-angled, coarsely coppery tomentose; bracteoles 2–4 × 0.5 mm, deciduous at or soon after anthesis, narrowly elliptic to lanceolate, glabrate and prominently glandular in bud, the base free, the margins scarious, the apex acute; hypanthium 1–2 mm long, campanulate, coarsely coppery tomentose; calyx lobes in unequal pairs, appressed-pubescent on the inner and outer surfaces, the margins ciliate, the apex rounded, the smaller pair triangular, 1.5–2 × 2 mm, the larger pair ovate, 2.5–3 × 3 mm; petals not seen; disk 3 mm diam., pubescent near style base; stamens and style not seen. Fruits 7–15 × 5–9 mm, ellipsoid; pericarp thin-walled, glandular, persistently appressed-pubescent; calyx persistent, erect; mature color unknown.

Habitat, distribution, and phenology. Dry thickets in the Río Lempa drainage, Honduras, 600–900 m elevation. Collected in flower in June; collected in fruit in August and September.

Eugenia lempana is a small tree with leaves, inflorescences, and flowers similar in size and shape to *E. guatemalensis*, which differs in having closely appressed vestiture that is thinning but persistent on the undersides of the leaves, branchlets, and inflorescences, persistent bracteoles that are 1 mm long or less, and smaller, globose or ovoid fruits. The coarse, coppery pubescence on the emergent growth is similar to that of *E. salamensis* Donnell Smith, as are the large, narrowly elliptic bracteoles

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Figures 19, 20. —19 (left). *Eugenia lempana* Barrie (*Molina R. 22427*; holotype, F). —20 (right). *Eugenia liesneri* Barrie (*Liesner 26428*; holotype, F).

that are deciduous at or soon after anthesis. In that species, however, the leaves, flowers, and fruits are twice the size of *E. lempana*'s, and the inflorescences axes are shorter, 3–7 cm long.

Paratypes. HONDURAS. **Comayagua:** Quebrada Los Mercedes, Valle Comayagua, *A. Molina R. 14379* (F). **Ocotepeque:** Llano del Ojo de Agua, 2 km W above Antigua Ocotepeque, drainage Lempa R., *A. Molina R. 24168* (F, MO); thickets of Lempa R. between Sta. Anita & Sta. Fé, *A. Molina R. & A. R. Molina 31061* (F, MO).

Eugenia liesneri Barrie, sp. nov. TYPE: Honduras. La Paz: Las Trancas, 5 km NW of Guajiquiro, 22 May 1993 (fl), *R. Liesner 26428* (holotype, F; isotype, MO). Figure 20.

Ab *Eugenia pittieri* floribus pedicellatis, bracteolis caducis et fructibus grandioribus differt.

Shrubs or small trees, to 6 m; young stems, leaves, and inflorescences minutely puberulent with simple, erect or recurved hairs, 0.1 mm; vegetative buds sericeous, the hairs silvery; branchlets compressed; bark gray, smooth. Leaves elliptic or ovate, 2.5–4.2 × 1–1.5 cm, 2.5–4 times as long as wide, coriaceous, drying nearly concolorous or a slightly paler green below; midvein flat or weakly convex above, weakly convex below; lateral veins 5 to 8 per side, straight and ascending, marginal veins weakly arched, ca. 1 mm from the margins; glabrate or with scattered, recurved hairs along the lower third of the margin above, the midvein glabrate or puberulent above and below, the hairs sometimes restricted to the lower third; glands apparent on both surfaces; base cuneate; margin revolute, decurrent along the petiole; apex caudate-acuminate, the tip ultimately rounded; petioles 2–3 mm long, flattened or concave dorsally, minutely puberulent. Inflorescences axillary, racemose or flowers solitary, the axis, bracts, and buds uniformly puberulent; axis 3–8 mm long; flowers 1 to 6; bracts 0.5 mm long, deciduous near anthesis, triangular, apex acute; buds 3–3.5 mm long, obovoid. Flowers pedicellate, the pedicels, bracteoles, hypanthium, and calyx uniformly puberulent; pedicels 4–8 mm long, noticeably longer than the internodes; bracteoles 0.5–1 mm long, spreading or divaricate in bud, deciduous in flower, the base free, the margins ciliolate, the apex acute; hypanthium 1–1.5 mm long, obconic, sub-stipitate; calyx lobes in markedly unequal pairs, puberulent on outer surface, the margins ciliate, the apex rounded, the smaller pair 0.8–1.3 × 0.8–1.5 mm, the larger pair 1.5–1.8 × 1.5–1.8 mm; petals 3–4.5 × 3–3.5 mm, widely elliptic or ovate, the margin ciliate at the apex, otherwise entire, the apex rounded; disk 1.8–2 mm diam., glabrous; stamens 50 to 65, 4–5 mm long; style 5–6 mm long, glabrous. Fruits 8–10 mm, globose; pericarp thin-walled, glandular, glabrous; calyx persistent, erect; mature color dark red to black.

Habitat, distribution, and phenology. Known from the cloud forest regions of Honduras, El Salvador, and eastern Guatemala, at elevations of 1500–2300 m. Collected in flower March–May; collected in fruit July–March.

In habit and its short-petiolate, elliptic or ovate leaves, *Eugenia liesneri* resembles *Eugenia pittieri* Standley, a species of wet forests at elevations below 1200 m that ranges from Guatemala to Panama. In the latter species, however, the flowers are sessile or with pedicels no more than 1 mm long, the bracteoles are persistent and sometimes connate near the base, and the floral disk is 0.5–1 mm in diameter. In *E. liesneri*, the flowers are borne on pedicels 4–8 mm long, the bracteoles are deciduous around the time the flowers open, and the floral disk is 1.8–2 mm in diameter. Many collections of *E. liesneri* have been identified as *E. tikalana* Lundell, a lowland species of Belize, the Peten, and adjacent areas of Mexico. *Eugenia tikalana* differs in having somewhat longer, to 7 cm, and broader, 2–2.5 times as long as wide, and smaller flowers with the disk 1–1.5 mm in diameter and the stamens less than 4 mm long.

Etymology. The epithet honors the collector of the type, Ronald Liesner of the Missouri Botanical Garden.

Paratypes. EL SALVADOR. **Santa Ana:** Bosque de Montecristo, *A. Molina R. & A. R. Molina 12626* (F, LL, NY, US); Bosque Nebuloso de Monte Cristo, *M. L. Reyna 944* (MICH); near Montecristo, *D. Witsberger 839* (MICH). GUATEMALA. **Chiquimula:** middle slopes of Motaña Norte to El Jutal on Cerro Brujo, SE of Concepción de las Minas, *J. A. Steyermark 31067* (F, NY). HONDURAS. **Intibucá:** Quebrada de Pelon de Guise, *A. Molina R. 6411* (F, GH); bosque de nubes de Calaveras, Cord. de Opaluca, *A. Molina R. 6416* (F); bosque nebuloso de Calaveras, cordillera Opalaca, 6 km NO de La Esperanza, *A. Molina R. 7977* (BM, F, WIS); bosque de montaña Calaveras, Cord. Opalaca, 8 km de La Esperanza, *A. Molina R. 8717* (F, MO, NY); bosque abierto, 25 km de La Esperanza, Montaña Opalaca, *A. Molina R. 10912* (F); cloud forest of Cordillera Opalaca betw. Calaveras & Pela Naríz, road to La Esperanza, *A. Molina R. 22608* (BM, DS, F, NY [2]); El Duraznillo on Cordillera Opalaca, *A. Molina R. & A. R. Molina 24491* (F[2]); open forest of Quebrada Lejarsia between km 9 and 11 on La Esperanza–Marcala rd., *A. Molina R. & A. R. Molina 24302* (F); Pela Naríz on Cordillera Opalaca, *A. Molina R. & A. R. Molina 25581* (F, MO, NY); Sierra Opalaca above El Duraznillo, *A. Molina R. & A. R. Molina 26080* (BM, F, NY). **La Paz:** 20 km SO Opatorao, *I. Colindres 68* (CAS, MO); Las Trancas, near Guajiquiro–San Isidro Road, ca. 11 km by road (ca. 5 km air) NW of Guajiquiro, Reserva Biológica Guajiquiro, *R. Evans 1713* (F); 20 km SO de Opatoro, *M. Martínez*

M. 59 (MO); Cordillera Guajiquiro, 5 km a Sabanetas *A. Molina R. & A. R. Molina 13876* (F, LL, NY); cut over mixed forest between Las Marias & El Cerron on Cordillera Guajiquiro, *A. Molina R. & A. R. Molina 24227* (BM, DS[2], F, GH); open forest of Montaña Verde on Cordillera Guajiquiro, *A. Molina R. & A. R. Molina 24388* (BM, DS, F, GH).

Eugenia lithosperma Barrie, sp. nov. TYPE: Costa Rica. Alajuela: San Ramón, RB Monteverde, Cordillera de Tilarán, Río Peñas Blancas, Refugio Aleman's Quebrada Rojas, 29 Feb. 1992 (fr), *E. Bello 4446* (holotype, INB; isotypes, F, MO). Figure 21.

Eugeniae hiraeifoliae aemulans, sed foliis paucioribus, ovatis vel ellipticis, fructibus globosis, testis induratis differt.

Trees to 15 m × 30 cm; young buds, branchlets, leaves, and inflorescences coarsely tomentose with yellow-brown, contorted, dibrachiate hairs, to 0.5 mm; branchlets compressed at the terminal node; bark tan, pubescent, flaking. Leaves ovate to elliptic, the blades 7–14 × 3–6 cm, 2–3 times as long as wide, chartaceous, drying a concolorous, dull green; midvein impressed above, elevated below; lateral veins 8 to 14 per side, slightly raised to weakly inscribed in the upper surface, prominent below and often tan in color; marginal veins similar to the laterals and weakly arched between them, 3–5 mm from the margins; upper surface soon glabrate or more commonly with a few, scattered, appressed hairs, the midvein glabrate or persistently pubescent, the lower surface and midvein persistently covered with appressed hairs, these thinning with age; glands on both surfaces numerous and small, usually dark below; base cuneate; margins decurrent into the inner edge of the petiole; apex acuminate to caudate-acuminate; petioles 8–12 mm long, sulcate dorsally, with scattered, appressed hairs. Inflorescences axillary, solitary, racemose, coarsely tomentose; axis 15–40 mm long; flowers 7 to 13, a terminal flower present; bracts 1–3 mm, deciduous by anthesis, cymbiform, ovate or lanceolate, tomentose on outer surface only, the base clasping, the margins ciliate, the apex acute; buds 2 mm long, obovoid. Flowers pedicellate, the pedicels 2–5 mm long, coarsely tomentose; bracteoles 1.5–2 × 1 mm, deciduous at or before anthesis, ovate to elliptic, tomentose on the outer surface only, the base free, the margins ciliate, the apex acute; hypanthium campanulate, 2–3 mm long, coarsely tomentose; calyx lobes widely ovate, in subequal pairs, 2.5–3 × 3–3.5 mm, coarsely tomentose on the outer surface and on the upper ⅓ to ¼ of the inner surface, the apex rounded to bluntly acute; petals 4.5–5.5 × 4–5 mm, widely elliptic, the margins ciliate; disk 3–4.5 mm diam., coarsely pubescent; stamens 100 to 130, 4–8 mm long; style 6–7 mm long, with scattered, contorted hairs. Fruits 20–35 × 20–35 mm, globose; pericarp fleshy, 1–2 mm thick, testa indurate, 1–2 mm thick; calyx present or absent, the lobes curled, the outer surface glandular, with a few, relictual appressed hairs; mature color unknown.

Habitat, distribution, and phenology. Wet montane forests along the Atlantic slope in Costa Rica at elevations of 100–1200 m. Collected in flower April–June; collected in fruit September–February.

This species is distinguished by the thick, indurate seed coat, a character otherwise unknown in Mesoamerican *Eugenia*. The coarse indumentum composed of simple and dibrachiate hairs, the elongate inflorescence, and the prominent, decidous bracteoles are similar to *E. hiraeifolia* Standley, which differs in having larger, obovate leaves, ellipsoidal fruits, and seeds with a thin, membranous testa. The leaves are similar those of *E. grayumii*, which bears only simple hairs and subsessile inflorescences.

Paratypes. COSTA RICA. **Alajuela:** Reserva Biológica Monteverde, Río Peñas Blancas, Eladio's y alrededores, *E. Bello 1175* (INB); Reserva Biológica Monteverde, Río Peñas Blancas, *E. Bello 531* (F, INB, MO); Reserva Biológica Monteverde, Río Peñas Blancas, Finca Toño González, *E. Bello 1624* (INB, MO); San Ramón, Reserva Forestal de San Ramón, *I. Wattenberg & H. Schäfer 59* (CR). **Cartago:** Chitara, Turrialba, *L. J. Poveda 186* (CR, MO). **Guanacaste:** Cordillera de Tilarán, Hotel Ecolodge, sendero de las cabinas, *G. Rivera 3054* (CR, F). **Heredia:** Finca La Selva, Sarapiquí, *K. S. Bawa 594* (MO); Finca La Selva, Puerto Viejo, *G. W. Frankie 78* (F, MO). **Puntarenas:** Puntarenas Cordillera de Tilarán, Monteverde San Gerardo Biological Station, Sendero Tabacón, *D. Pennys 448* (F, INB).

Eugenia locuples Standley & L. O. Williams ex Barrie, sp. nov. TYPE: Honduras. El Paraíso: orilla de Quebrada Siete Pasos y vecindades NE de Danlí, 14 Mar. 1963 (fl), *A. Molina R. 11387* (holotype, F; isotype, NY). Figure 22.

Eugeniae quercetorum aemulans, sed rhachidibus 1–2 mm longis, pedicellis 2–4 mm longis et fructibus globosis vel oblatis, 7–9 mm diametro differt.

Shrubs or small trees, to 5 m; young stems, leaves, and inflorescences coarsely rufous-tomentose, the hairs 0.2–0.5 mm, dibrachiate and contorted; branchlets terete or weakly compressed; bark flaky, tan or gray appressed-pubescent, the hairs cinereous. Leaves elliptic, the blades 4–7.5 × 1–3 cm, 2.2–3 times as long as wide, coriaceous, drying a dark green or olive above, lighter below;

21

22

Figures 21, 22. —21 (left). *Eugenia lithosperma* Barrie (*Bello 4446*; holotype, INB). —22 (right). *Eugenia locuples* Standley & L. O. Williams ex Barrie (*Molina R. 11387*; holotype, F).

midvein impressed above, elevated below; lateral veins 8 to 12 per side, plus intermediates; marginal veins similar to the lateral veins and weakly arched between them, 1–2 mm from the margins; upper surface of mature leaves with a few scattered hairs, eventually glabrate and nitid, the lower surface remaining villosulous much longer, the hairs cinereous, but ultimately glabrate; glands obscure on both surfaces, or with scattered, dark glands on the lower surface only; base cuneate; margins revolute; apex acute to acuminate; petioles 4–5 mm long, impressed dorsally, ultimately glabrate. Inflorescences axillary, short-racemose, solitary, the axis, bracts, and buds rufous-tomentose; axis 1–2 mm long, often obscured by the buds and flowers; flowers 5 to 7, a terminal flower sometimes present; bracts 1–2 mm long, persistent through anthesis, absent in fruit, cymbiform, the apex acute; buds 4–5 mm long, globose or obovoid. Flowers pedicellate, the pedicels, bracteoles, hypanthium, and calyx rufous-tomentose; pedicels 2–4 mm long; bracteoles 1.5–2 × 0.5 mm, deciduous at anthesis or soon after, elliptic, the inner surface glabrous, the base free, the margins obscured by the vestiture, the apex acute; hypanthium 1.5–2 mm long; obconic or campanulate, calyx lobes in subequal pairs, 2–3 × 2–3 mm, the outer surface densely rufous-tomentose, the inner surface glabrous, the apex bluntly acute or rounded; petals 4–5 × 3–4 mm, elliptic or obovate, the margins ciliate, the apex rounded; disk 2.5–3 mm diam., with scattered, erect hairs; stamens 70 to 100, 5–7 mm long; style 6–8 mm long, glabrous. Fruits 7–9 × 7–9 mm, globose or oblate, the base entire or substipitate; pericarp thin-walled, glandular, weakly ribbed, thinly vested with pale, dibrachiate hairs, more densely so at the base and apex; calyx persistent, erect, tomentose without, glabrous within; mature color red.

Habitat, distribution, and phenology. Open, mixed forests in Honduras and Nicaragua at elevations of 500–900 m. Collected in flower January–April; collected in fruit April–July.

Between 1950 and 1970, several sets of specimens were widely distributed under the names "Eugenia locuples Standley & Williams" and "Eugenia quercetorum Standley & Williams." Never validly published, the names did appear in print at least once as nomina nuda (Molina, 1975: 82). Although two species are clearly involved, the names were not applied consistently and specimens of either species may be labeled with either name. Both species are shrubs or small trees of 5 m or less, with the emergent growth coarsely tomentose with dibrachiate, coppery-golden hairs, which are ultimately shed. *Eugenia locuples* differs from *E. quercetorum* Barrie in having narrower leaves (2.2–3 vs. 1.3–2.3 times as long as wide), much shorter inflorescence axes (1–2 mm vs. 5–25 mm), shorter pedicels (2–4 mm vs. 3–10 mm), and smaller fruits. The juvenile vestiture tends to persist on the underside of the leaves in *E. locuples*, though it is ultimately lost.

Etymology. The epithet translates as "rich" or "opulent" and is probably a reference to the luxuriant, reddish gold tomentum that covers the emergent growth.

Paratypes. HONDURAS. **El Paraíso:** en matorrales de R. Vallecillo, NE de Danlí, *A. Molina R. 7591* (F[2]); orillas del R. Teupasenti ca. del pueblo de Teupasenti, *A. Molina R. 11900* (F, GH, NY); Sierra El Chile entre El Robledal y El Junquillo, *A. Molina R. 14190* (F, LL, NY); km 73 entre El Ojo de Agua y Río California, *A. Molina R. 14485* (F, NY); along or near R. California, betw. R. Choluteca & Jacaleapa, *P. C. Standley 17182* (F); R. California, base of Sierra de la Villa Santa, *P. C. Standley 28112* (F); canyon ca. 3 km W of Danlí, *L. O. Williams 18170* (F, GH). **Francisco Morazón:** a orillas de la Quebrada Cantarranas NE de Cantarranas, *A. Molina R. 7804* (F, GH). NICARAGUA. **Estelí:** along Río Estelí, ca. 8 km SW of Estelí, *A. Molina R. & L. O. Williams 20186* (F, NY, US, WIS[2]). **Jinotega:** along trail betw. Jinotega & Las Mesitas, W of Jinotega, *P. C. Standley 9722* (F); along trail betw. Jinotega & Las Mesitas, W of Jinotega, *P. C. Standley 9748* (F); region of La Montañita & Las Mesitas, in sierra W of Jinotega, *P. C. Standley 10398* (F, MICH).

Eugenia magniflora Barrie, sp. nov. TYPE: Costa Rica. Limón: Pococi, R.N.F.S. Barra del Colorado, Llanura del Tortuguero, Sardinas, 1 Jan. 1995 (b, fl), *F. Araya 705* (holotype, INB; isotype, F). Figure 23.

Ab aliis *Eugeniae* mesoamericanae floribus maximis et antheris linearis differt.

Shrubs or trees to 7 m or more; branchlets, buds, emerging leaves, and inflorescences tomentose, the hairs simple and dibrachiate, contorted, ochraceous; branchlets compressed, glabrate; bark white, flaky. Leaves obovate to elliptic, the blades 20–35 × 9–16 cm, 2–2.3 times as long as wide, chartaceous, drying dark green above, tan below; midvein flat above, with one or several parallel, irregular ridges, elevated below; lateral veins 13 to 15, flat or inscribed above, raised below; marginal veins similar to lateral veins, weakly arched, ca. 5 mm from the margins; upper and lower surfaces sparsely pubescent or glabrate, the midvein persistently pubescent above and below; glands obscure or numerous, minute and pitted above, scattered and dark below; base cuneate; margins entire; apex abruptly acuminate; petioles 10–15 mm long, flattened or weakly indented dorsally, pubescent. In-

Figures 23, 24. —23 (left). *Eugenia magniflora* Barrie (*Araya 705*; isotype, F). —24 (right). *Eugenia mcphersonii* Barrie (*McPherson 13579*; holotype, MO).

florescences cauliflorous, fasciculate; bracts 4–5 × 1 mm, deciduous around anthesis, linear, tomentose on the inner and outer surfaces, the margins ciliate, the apex acute; buds 20 × 20 mm, globose, tomentose. Flowers extremely large, pedicellate, the pedicels, bracteoles, hypanthium, and calyx densely tomentose with ochraceous, contorted, simple and dibrachiate hairs; pedicels 6–10 × 2–2.5 mm; bracteoles fused, forming a 4-lobed involucre, ca. 10 mm diam., the inner and outer surfaces tomentose, the margins ciliate, the apices of the lobes acute; hypanthium 5–6 mm long, obconic, prominently tuberculate, the base attenuate; calyx lobes in unequal pairs, the larger pair 20–25 × 20–25 mm, hooded, enveloping the expanding bud, the inner and outer surfaces tomentose, the margins fused approximately half their length, splitting at anthesis, the apex rounded; petals not seen; disk 12–15 mm diam., pubescent at the base of the style; stamens ca. 600, 10 mm long, the anthers 2.5–3 mm long, orange; style 15 mm long, glabrous. Fruits 35 × 35 mm, subglobose; pericarp fleshy, tuberculate but not noticeably costate, uniformly covered with ochraceous hairs when immature; mature fruits not seen.

Habitat, distribution, and phenology. An understory tree or shub of the wet lowland forests along the Atlantic slope in Costa Rica at elevations of 0–100 m. Collected in flower in January and February.

Eugenia magniflora is readily distinguished from other Mesoamerican *Eugenia* by the large cauliflorous flowers with the bracteoles fused, forming a 4-lobed involucre, the tuberculate hypanthium, the partially fused, hooded calyx lobes, the linear anthers, and tuberculate fruits. Though in all ways larger, the flowers are somewhat similar to those of *E. feijoi* O. Berg, a predominately South American species that has been collected in Panama, notably in partially fused calyx lobes and the linear anthers, here 2.5–3 mm long, with a terminal appendage. In most species of *Eugenia* the anthers are oblong, less than 1 mm long, and terminated by a gland. According to the label on the type of *E. magniflora*, the anthers are orange, an unusual color in *Eugenia*, where the anthers are typically white or pale yellow.

Paratype. COSTA RICA. **Heredia:** along trail through forest between Finca Bella Vista (a.k.a. Plastico) on the Quebrada Tigre, and Las Horquetas, ca. 6 km SW of Las Horquetas, *M. Grayum et al. 5068* (CR, MO, F).

Eugenia mcphersonii Barrie, sp. nov. TYPE: Panama. Chiriquí: Fortuna Dam region, along trail to Cerro Hornito (Pate de Macho) on S ridge of watershed, 17 Jan. 1989 (b, fl), *G. McPherson 13579* (holotype, MO; isotype, CR). Figure 24.

Ab *Eugenia costaricensi* floribus majoribus, bracteolis caducis et fructibus majoribus, ellipsoidalibus vel ovoideis differt.

Trees to 10 m; young growth apparently glabrous except for a few simple hairs, ca. 0.1 mm, on the buds, emergent leaves, and the margins of the bracts, bracteoles, and calyx lobes; branchlets compressed; bark chestnut brown to gray. Leaves elliptic to obovate, the blades 3–6 × 1–2.5 cm, 2–3 times as long as wide, coriaceous, drying dull dark brown above, reddish brown below; midvein flat or convex above and below; lateral veins 10 to 14 per side, straight and ascending; marginal veins ca. 1 mm from the margins; upper and lower surfaces glabrate; glands obscure above, obscure or scattered below; base cuneate; margins decurrent into the splayed inner edge of the petiole; apex abruptly acuminate to caudate-acuminate; petioles 2–5 mm long, sulcate, glabrate. Inflorescences axillary or at leafless nodes, sessile, solitary; flowers 1 to 4; bracts deciduous; buds 3–4.5 mm long, pyriform. Flowers pedicellate, the pedicels 5–9 mm long, weakly compressed, glabrous; bracteoles 0.3–0.5 × 0.7–0.7 mm, deciduous in flower, the base free, the margins scarious and occasionally ciliate, the apex rounded, glabrous or with tufted hairs; hypanthium 1.5–2.5 mm long, campanulate, glabrous, calyx lobes in unequal pairs, the margins scarious, glabrate or with a few scattered hairs, the apex rounded, the smaller pair 1.5–3 × 2–2.5 mm, the larger pair 3–4.5 × 2–3 mm; petals 4–5 × 3.5–4 mm, elliptic, the margins entire, the apex rounded; disk 2–3 mm diam., with scattered, erect, coppery hairs; stamens 70 to 90, 4–4.5 mm long; style 5 mm long, glabrous. Fruits 20–25 × 10–15 mm, ellipsoid or ovoid; pericarp thin-walled, glandular, glabrous; calyx persistent, erect; mature color red to black.

Habitat, distribution, and phenology. Known only from the montane rain forests and cloud forests in western Panama at elevations of 1100–2200 m. Collected in flower March–May; collected in fruit November–February.

The leaves and inflorescences of *Eugenia mcphersonii* are similar to the more widespread *E. costaricensis* O. Berg, differing in the slightly larger flowers with deciduous bracteoles and ellipsoid rather than globose fruits. The flowers and fruits of

E. costaricensis are commonly stipitate or substipitate; in this species, they are sessile.

Etymology. Named for the collector of the type, Gordon McPherson, noted authority on the Panamanian flora.

Paratypes. PANAMA. **Bocas del Toro:** Cerro Colorado mine area, divide road; along trail into Bocas & in woods on Pacific slope, from Chami Sta. to ca. 9 mi. along rd., *B. Hammel & J. Trainer 14920* (F). **Chiriquí:** 3.5 mi. NE of Boquete, end of road along R. Palo Alto, *B. A. Hammel 5699* (MO); end of rd. past Palo Alto E of Boquete, *B. A. Hammel 6068* (MO); Fortuna Dam region, along trail to Cerro Hornito (Pate de Macho) on S ridge of watershed, *G. McPherson 13570* (CR, F); N of San Felix at Chiriquí–Bocas del Toro border, on Cerro Colorado copper mine rd. along Continental Divide, *S. Mori & J. Kallunki 5805* (MO), *S. Mori & J. Kallunki 5936* (MO); near Cerro Colorado, ca. 4.2 mi. from Chami Camp, *G. McPherson 8961* (CR, F, MO); Boquete, Cerro Horqueta, along path, *C. von Hagen & W. von Hagen 2030* (MO, NY).

Eugenia molinae Barrie, sp. nov. TYPE: Honduras. El Paraíso: Matorrales de Quebrada El Coyol entre El Junquillo y El Robledal, 12 June 1964 (fl), *A. Molina R. 14138* (holotype, F; isotypes, F, GH, NY). Figure 25.

Eugeniae rhombeae aemulans, sed ramulis, foliis et inflorescentiis pilosulis, foliis ellipticis et fructibus ellipsoidalibus differt.

Shrubs or small trees, to 5 m; stems and leaves pilosulous, the hairs simple, erect or recurved, 0.3–0.8 mm; branchlets compressed, hirsute; bark smooth, tan. Leaves elliptic, the blades 3–5 × 1.8–3 cm, 1.6–2.2 times as long as wide, coriaceous, concolorous; midvein flat above, convex below; lateral veins 6 to 8 pairs, obscure above, slightly raised on the lower surface; marginal veins arched, 1–2 mm from the margins; upper and lower surfaces uniformly pilosulous, the hairs persistent, widely spaced; glands few, pellucid, scattered on the lower surface only; base cuneate to rounded; margins cartilaginous, decurrent along the petiole; apex bluntly acute or rounded; petioles 2–3 mm long, flattened or depressed dorsally, hirsute. Inflorescences axillary or cauliflorous, sessile or short-racemose, or flowers solitary; axis 0–1.5 mm long, pilosulous; flowers 1 to 6; bracts 1.5–2.5 mm, deciduous, cymbiform, hirsute, the margins ciliate, the apex acute; buds 3–3.5 mm long, obconic, hirsute. Flowers pedicellate, the pedicels 5–9 mm long; bracteoles 0.5–0.9 × 0.3 mm, persistent, elliptic, hirsute, the base free, the margins ciliate, the apex acuminate; hypanthium 1.5 mm long, campanulate, glabrous or with scattered, erect hairs, contrasting with the hirsute pedicel and bracteoles, the base attenuate or substipitate; calyx lobes ovate, concave, in unequal pairs, vestiture similar to the hypanthium, the margins scarious-ciliate, the apex rounded, the smaller pair 1.5 × 2 mm the larger pair 2.5–3 × 2 mm; petals 3.5–6 × 2–2.5 mm, the margins ciliate, the apex rounded; disk 2–2.5 mm diam., glabrous or the staminal ring hirsute; stamens 60 to 70, 4.5–5.5 mm long; style ca. 6 mm long, glabrous. Fruits 8–10 × 7–8 mm, broadly ellipsoid; pericarp thin-walled, glandular, glabrous; calyx persistent, erect; mature color black.

Habitat, distribution, and phenology. Xerophytic forests, matorrales in Honduras at elevations of 600–1300 m. Collected in flower in June; collected in fruit in September.

Eugenia molinae may be distinguished from other Honduran *Eugenia* by the elliptic, short-petioled, coriaceous leaves having both surfaces persistently and uniformly pilosulous with a mixture of widely spaced, straight and recurved hairs.

Etymology. The epithet honors Antonio Molina R. of the Escuela Agrícola Panamericana, the noted authority on the flora of Honduras and adjacent regions, the author of numerous new taxa, and a prolific collector. Among his collections are the types for six of the species described in this publication.

Paratypes. HONDURAS. **Intibucá:** jct. of Jicarito & Gallo Creeks, drainage of the R. Yeguare, *A. Molina R. 152* (BM, F, GH, MO, US, WIS); vicinity of Mazaguara, valley of Jesus de Otoro, *A. Molina R. 22598* (F, MO, NY).

Eugenia monteverdensis Barrie, sp. nov. TYPE: Costa Rica. Puntarenas: in Mata's pasture, Monteverde, 24 Aug. 1975 (fr), *G. Hartshorn 1778* (holotype, CR; isotypes, CR, F, MO). Figure 26.

Ab *Eugenia tilarana* foliis cum basibus revolutis, floribus majoribus, fructibus majoribus, ochraceis differt.

Trees to 20 m or more; young growth coppery appressed-pubescent, the hairs dibrachiate; branchlets compressed, weakly 4-angled; bark gray, glabrate. Leaves elliptic or obovate, the blades 8–12 × 2.5–6 cm, 2–2.7 times as long as wide, chartaceous, drying dark green above, pale green or brown below; midvein sulcate or impressed above, raised below; lateral veins 8 to 10 per side, moderately curving-ascending, raised on the lower surface; marginal veins similar to the laterals and arched between them, 1–2 mm from the margins; upper and lower surfaces uniformly pubescent with appressed coppery or cinereous hairs, the upper surface soon glabrate, the vestiture more persistent on the lower surface, but it, too, ultimately glabrate or with a few, scattered hairs; glands obscure above,

Figures 25, 26. —25 (left). *Eugenia molinae* Barrie (*Molina R. 14138*; holotype, F). —26 (right). *Eugenia monteverdensis* Barrie (*Hartshorn 1778*; holotype, CR).

dark and numerous below; base cuneate, typically strongly revolute near the petiole, often appearing "pinched"; margins attenuate along the petiole; apex acuminate; petioles 8–15 mm long, sulcate dorsally, appressed-pubescent. Inflorescences axillary, racemose, solitary or more commonly 2 or 3 superposed, uniformly coppery appressed-pubescent; axis 10–20 × 1–2 mm, 4-angled; flowers 10 to 16; bracts persistent, 0.5–1.5 mm long, cymbiform, glabrate in bud, dark and contrasting with the coppery axis and pedicel, prominently glandular; buds 3.5–5 mm long, obovoid. Flowers pedicellate, the pedicels 4–10 mm long, 4-angled; bracteoles persistent, separate or fused and forming an involucre 2 mm across, dilated at anthesis, if separate then 1–1.5 × 1 mm, ovate, glabrate and prominently glandular, dark and contrasting with the coppery pedicel and hypanthium, the base free, the margins scarious, the apex acute; hypanthium 2–4 mm long, campanulate, entire or weakly ribbed; calyx lobes widely ovate, in markedly unequal pairs, coppery appressed-pubescent on both surfaces, the margins ciliolate, the apex rounded, the smaller pair 1 × 2 mm, the larger pair 3–3.5 × 4 mm; petals 4–4.5 × 3.5–4 mm, ovate, the margins entire, the apex rounded; disk 3–3.5 mm diam., glabrous or with a few, scattered, erect hairs; stamens ca. 100, 5–7 mm long; style 7–9 mm long, glabrous. Fruits 25–35 × 20–22 mm, irregularly obovoid or oblong, the base elongate; pericarp coriaceous, rugose, persistently dull brown-tomentose but ultimately glabrate; calyx absent; mature color dull yellow.

Habitat, distribution, and phenology. Montane forests of central Costa Rica at elevations of 1000–2000 m. Collected in flower January–November; collected in fruit January–August.

Eugenia monteverdensis is one of three newly described species from the Monteverde region, the others being *E. tilarana* and *E. zuchowskiae*, which have been persistently identified as either *E. octopleura* Krug & Urban or *E. guatemalensis*. All have axillary, racemose inflorescences, solitary or several superposed, with 4-angled axes, densely vested with appressed, coppery, dibrachiate hairs. *Eugenia monteverdensis* is distinguished by the elliptic or obovate leaves with the margins strongly revolute near the petiole and the yellow, irregularly obovoid or ellipsoid fruits that lack ribbing. The fruits of *E. octopleura*, *E. tilarana*, and *E. zuchowskiae* are ribbed; the fruits of *E. guatemalensis* are unribbed, but much smaller (5–12 × 5–9 mm).

Paratypes. COSTA RICA. Reserva Monteverde, Cordillera de Tilarán [covers parts of Alajuela, Puntarenas, and Guanacaste], *V. J. Dryer 1358* (CR, F), *V. J. Dryer 1626* (CR, F, MO). **Alajuela:** Reserva Forestal San Ramón, trail S of the station, *J. Bittner & G. Herrera 2028* (CR); La Palma de San Ramón, *A. Brenes 4625* (F); Monteverde Cloud Forest Reserve, Peñas Blancas R. valley on Atlantic slope, *W. A. Haber & E. Bello 5816* (MO); San Ramón, Cordillera de Tilarán, El Castillo, primary forest patch near Arenal Vista Lodge, lado SE del lago, *P. Harmon 349* (INB, MO); Zarcero, *A. Smith A239* (A, F, MO, US); arbre au bord du R. Segundo, *A. Tonduz 1712* (BR). **Cartago:** entre Turrialba y Florencia, *A. Jiménez M. 3318* (CR, F, MO); vicinity of La Congreja, ca. 10 km S of El Tejar, Cord. de Talamanca, *L. O. Williams et al. 24111* (F). **Guanacaste:** Monteverde, Transect 6, *A. Gentry et al. 71589* (F, MO). **Heredia:** Zurquí, *P. C. Standley & M. Valerio 48254* (F). **Puntarenas:** ca. 2 km SW of Monteverde, on the Pacific watershed, *W. C. Burger & J. L. Gentry Jr. 8801* (F); Cordillera de Tilarán, camino que va de la Reserva Absoluta de Cabo Blanco subiendo por alto San Luis, *A. Fernández 1386* (CR, INB); Monteverde, *A. Gentry & W. A. Haber 48764* (CR, MO); Monteverde, community, *W. A. Haber 206* (CR, MO); Monteverde, near lab, *W. A. Haber 224* (CR, MO); Monteverde, upper community, *W. A. Haber 758* (CAS, MO), *W. A. Haber 764* (BM, MO), *W. A. Haber 765* (MO), *W. A. Haber 766* (MO); Reserva Biológica Monteverde, Pacific slope, Research Trail, *W. Haber et al. 10810* (CR, F, MO); Reserva Biológica Monteverde, Pacific slope, road from field station to divide, *W. Haber & W. Zuchowski 10852* (CR[2], K). **San José:** La Palma, *A. Tonduz 12558* (A, F, GH, NY); San Pedro de Coronado, *M. Valerio 1643* (F).

Eugenia paloverdensis Barrie, sp. nov. TYPE: Costa Rica. Guanacaste: Bagaces, P.N. Palo Verde, Valle de Tempisque, Est. Palo Verde, Cerro Guayacán, 23 June 1993 (fl), *U. Chavarría 826* (holotype, INB; isotypes, CR, F, MO). Figure 27.

Eugeniae principium aemulans, sed indumentis ex parte dibrachiatis, floribus et fructibus majoribus, subsessilibus differt.

Shrubs or small trees; young growth coarsely appressed-pubescent, the hairs simple and dibrachiate, coppery; branchlets and leaves soon glabrate; branchlets somewhat flattened at the nodes; bark brown to gray. Leaves elliptic to ovate or lanceolate, the blades 3–6.5 × 1.5–2.2 cm, 1.6–3 times as long as wide, coriaceous, drying green to olive, concolorous or somewhat paler below, the midvein a contrasting white or brown; midvein flat or concave and between 2 parallel ridges above, convex below; lateral veins 6 to 8, straight; marginal veins similar to the lateral veins, straight, ca. 1 mm from the margins; both surfaces with appressed, cinereous dibrachiate hairs somewhat persistent, but eventually glabrate; glands pellucid, numerous and prominent on both surfaces; base rounded; margins merging abruptly into the inner edges of the petiole; apex acute or acuminate; petioles 1.5–2.5 mm long, pubescent with appressed, cinereous hairs or gla-

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INSTITUTO NACIONAL DE BIODIVERSIDAD
EN COLABORACION CON EL MISSOURI BOTANICAL GARDEN (MO)

HOLOTYPE of:
Eugenia paloverdensis Barrie

F.R. Barrie Feb 2004
MISSOURI BOTANICAL GARDEN [MO]

FLORA DE COSTA RICA
MYRTACEAE dup.= 5
Eugenia

Det.

GUANACASTE: Cantón de Bagaces.
P. N. Palo Verde
Valle del Tempisque:
Estación Palo Verde; Cerro Guayacán.
10°21'00"N 85°21'00"W 10 m
Arbusto de 2 m. Flores blancas, anteras amarillas. Aroma a perfume. Creciendo en cerros calizos de la Fila Guayacán.

Ulises Chavarría 826 23 JUN 1995

INSTITUTO NACIONAL DE BIODIVERSIDAD
EN COLABORACION CON EL MISSOURI BOTANICAL GARDEN (MO)

28

HOLOTYPE of
Eugenia quercetorum
Standl. et L.O. Williams ex Barrie
F.R. Barrie Feb 2004
MISSOURI BOTANICAL GARDEN [MO]

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3946 Herbarium of Escuela Agrícola Panamericana

Eugenia quercetorum Standl. & L. Wms.

Arbusto 3 m., en el Rio Lizapa, Llano Lizapa,

Drainage of the Rio Yeguare, at about Longitude 87° W. and Latitude 14° N., Department of El Paraiso

Antonio Molina R. Mayo 17, 1951 Alt. 950 m.

Figures 27, 28. —27 (left). *Eugenia paloverdensis* Barrie (*U. Chavarría 826*; holotype, INB). —28 (right). *Eugenia quercetorum* Standley & L. O. Williams ex Barrie (*Molina R. 3946*; holotype, F).

brate, channeled on the upper surface. Inflorescences axillary, racemose, solitary, uniformly appressed-pubescent, coppery but soon cinereous; axis 1–3 mm long; flowers 2 to 6; bracts 1 × 0.5 mm, persistent, cymbiform, glabrate before the axis and then darker in color and contrasting with it, the margins entire, the apex acute; buds 2 mm, obovoid. Flowers pedicellate, the pedicels 1–2 mm long, approximately equal to the axis, bracteoles 1 × 0.3 mm, persistent, lanceolate, conspicuously glandular, glabrate before the hypanthium and then darker in color and contrasting with it, the base free, the apex acute; hypanthium 1 mm long, campanulate, appressed pubescent; calyx lobes in unequal pairs, the inner and outer surfaces appressed-pubescent, the margin entire, the apex rounded to bluntly acute, the smaller pair 1–1.5 × 1.5–2 mm, the larger pair 1.5–3 × 1.5–2 mm; petals ovate, 4–4.5 × 4 mm, the margin ciliate near the apex, the apex rounded; disk 2.5–3 mm diam., glabrous or with a few hairs at the base of the style; stamens ca. 80, 5–8 mm long; style 6–7 mm long, with a few basal hairs. Fruits 10–14 × 10–12 mm, broadly ellipsoid to globose; pericarp thin-walled, glandular, glabrous; calyx persistent, erect; mature color purple-black.

Habitat, distribution, and phenology. Known only from the lowland dry forest on the Pacific coast in Guanacaste Province, Costa Rica, at elevations of 0–100 m. Collected in flower in June; collected in fruit in October.

A small shrub or tree with leaves similar in size and shape to *Eugenia principium*, *E. paloverdensis* may be distinguished by its vestiture, a mixture of simple and dibrachiate hairs, the flowers with pedicels 1–2 mm long, and calyx lobes similar in color to the hypanthium. In *Eugenia principium*, the hairs are simple, and the flowers are borne on pedicels 6–14 mm long and have pink, petaloid calyx lobes.

Paratypes. COSTA RICA. **Guanacaste:** Bagaces, P.N. Palo Verde, Valle de Tempisque, Est. Palo Verde, creciendo entre Fila Guayacán y Fila Cueva del Tigre, *U. Chavarría 850* (CR, F, INB, MO); Est. Biológica Palo Verde, *M. F. Quigley 937* (MO).

Eugenia quercetorum Standley & L. O. Williams ex Barrie, sp. nov. TYPE: Honduras. El Paraíso: drainage of the Río Yeguare, en el Río Lizapa, Llano Lizapa, 17 June 1951 (b), *A. Molina R. 3946* (holotype, F; isotypes, BM, GH, MO). Figure 28.

Eugeniae locuplete aemulans, sed inflorescentiis rhachidibus 5–25 mm longis, pedicellis 3–10 mm longis, fructibus ellipsoidalibus vel subglobosis, 13–17 mm longis differt.

Shrubs or small trees 2–5 m; young stems, buds, leaves, and inflorescences densely tomentose, the hairs 0.3–1 mm, dibrachiate, contorted, rufous or cinereous; branchlets weakly compressed; bark tan or gray, flaky, ultimately glabrate. Leaves elliptic or widely elliptic to obovate, the blades 3.5–8 × 2–5 cm, 1.3–2.3 times as long as wide, chartaceous, drying dark green and nitid above, olive below; midvein depressed or sulcate above, convex below; lateral veins 5 to 8 per side, obscure above on mature leaves, raised below; marginal veins similar to the laterals and arched between them, 1–2 mm from the margin, obscure above; surfaces of young leaves villosulous, the hairs rufous, dibrachiate, surfaces of mature leaves glabrous or nearly so; glands convex on the upper surface of young leaves, obscure or rarely punctate on mature leaves, dark and densely to thinly distributed over the lower surface; base cuneate to broadly cuneate or rounded; margins revolute, decurrent into the inner edge of the petiole; apex bluntly acute; petioles 4–10 mm long, sulcate dorsally, glabrate or with cinereous or rufous, dibrachiate hairs. Inflorescences axillary, racemose, solitary, the axis, bracts, and buds uniformly rufous-tomentose, the hairs dibrachiate; axis 5–25 × 1 mm; flowers 4 to 11, a terminal flower often present; bracts 1–2 mm long, deciduous, cymbiform, the margin scarious, the apex rounded. Flowers pedicellate, the pedicels, hypanthium, and calyx uniformly rufous-tomentose, the hairs dibrachiate; pedicels 3–10 mm long; bracteoles 1.5–2.5 × 1 mm, deciduous at or prior to anthesis, elliptic or ovate, initially rufous-tomentose, becoming glabrate and contrasting with the hypanthium before falling, the base free, the margins ciliate, the apex acute; hypanthium 1.5–2 mm long, campanulate; calyx lobes in unequal pairs, the inner and outer surfaces densely vested with contorted, rufous or cinereous, dibrachiate hairs, the apex rounded, the smaller pair 2–2.5 × 2–3 mm, the larger pair 3–3.5 × 3–4 mm; petals 3.5–4.5 × 4–4.5 mm, depressed ovate, glabrous or with a few scattered hairs, the apex bluntly acute, the margins ciliate; disk 3–4 mm diam., rufous-tomentose at base of style; stamens ca. 80, 4–6 mm long; style 6–7 mm long, with hairs scattered along entire length. Fruits 13–17 × 10–11 mm, subglobose or ellipsoid; pericarp thin-walled, glandular, weakly and irregularly costate, with scattered, short hairs or a few dibrachiate hairs at base and apex; calyx persistent, pubescent within and without; mature color deep purple or black.

Habitat, distribution, and phenology. Known from oak forests and cloud forests at elevations of

400–1500 m. Collected in flower in July; collected in fruit September–January.

The name *Eugenia quercetorum*, like *E. locuples*, appeared on several sets of specimens widely distributed 30 to 50 years ago. Though never validly published, the name appeared in print at least once as a nomen nudum (Molina, 1975). As noted in the discussion of *E. locuples*, *E. quercetorum* differs most notably in having broader leaves, shorter inflorescence axes, shorter pedicels, and larger fruits.

Etymology. The epithet refers to the species' oak forest habitat.

Paratypes. HONDURAS. **El Paraíso:** drainage of the R. Yeguare, Quebrada Chupadero, N de Yuscarán, *A. Molina R. 1684* (F, GH), *A. Molina R. 1687* (F, GH, MO), *A. Molina R. 1695* (F, GH); drainage of the R. Yeguare, en la Quebrada El Muro, entre El Empalme & El Muro, 20 km al N de Yuscarán, *A. Molina R. 4013* (F, GH); orillas de la quebrada, Valle Jamastrán, *A. Molina R. 7488* (F); Valle Jamastrán, *A. Molina R. 7498* (F); a orillas del R. Oropolí cerca de Oropolí, *A. Molina R. 10078* (F[2], NY); entre San Lucas y Manzaragua, *A. Molina R. 10750* (BM, F, GH, MO, NY, WIS); Pinares y colinas rocosas de Chupadero, carr. a Yuscarán, *A. Molina R. 14429* (F, LL, NY); Quebrada de Dantas, on rd. between Las Mesas & Yuscarán, *P. C. Standley 14971a* (F), *P. C. Standley 14973a* (F, MICH), *P. C. Standley 14985* (F); Cerros el Zapotillo, road betw. Zamorano & Guínope, *G. L. Webster et al. 11978* (F, GH, MICH[2], MO); valley of R. Dantas, barranco El Muro, *G. L. Webster et al. 12042* (MICH[2]); Quebrada El Muro betw. Las Mesas & Yuscarán, *L. O. Williams 42806* (F). **Francisco Morazán:** along paved hwy. between Tegucigalpa & Talanga, 35 km N of Tegucigalpa, *T. B. Croat & D. P. Hannon 63908* (MO); entre Cuesta de Los Muertos y Monte Obscuro, Cordillera Azacualpa, *A. Molina R. 14519* (F, NY); between Tegucigalpa & Puente Colorado, near Choluteca R. on way to Talanga, *A. Molina R. & A. R. Molina 25827* (F).

Eugenia riosae Barrie, sp. nov. TYPE: Costa Rica. Guanacaste: PN Guanacaste, Estación Pitilla, Sendero El Mismo, Finca La Pasompa, 9 Dec. 1990 (fl), *Ríos 257* (holotype, INB; isotypes, CR, F, MO, SEL). Figure 29.

Habitu *Eugenia vesca* similis, sed bracteolis parvioribus et caducis, hypanthio conspicue glanduloso, fructibus irregulariter ellipsoidalibus vel globosis, 10–25 mm longis differt.

Trees 5–10 m; young growth apparently coarsely tomentose, the hairs ca. 0.5 mm, simple or dibrachiate, soon reduced to relictual hairs in the axis of the leaves and branchlets only; branchlets flattened at nodes; bark gray, puberulent, the hairs 0.1–0.2 mm, simple, erect, or glabrous. Leaves elliptic to obovate, the blades 7–12 × 3–6 cm, 1.6–2.3 times as long as wide, chartaceous, drying olive above, yellow-green below; midvein flat to sulcate above, convex below; lateral veins 12 to 14 per side, plus intermediates; marginal veins similar to the laterals and weakly arched between them, 1–2 mm from the margins; both surfaces of mature leaves glabrous; glands pellucid, prominent, large and small on both surfaces; base cuneate; margins decurrent into the inner edge of the petiole; apex abruptly acuminate; petioles 5–7 mm long, concave dorsally, minutely puberulent. Inflorescences axillary and cauliflorous, solitary, fasciculate; flowers 8 to 10; bracts 0.2–0.3 mm long, deciduous prior to anthesis, minute, triangular, minutely puberulent; buds 2–3 mm long, turbinate. Flowers sessile or nearly so, the pedicels less than 0.5 mm long, conspicuously glandular; bracteoles 0.5–0.7 × 0.5 mm, deciduous soon after anthesis, ovate, conspicuously glandular, the margins scarious-ciliate, the apex acute or rounded; hypanthium 1.5–2 mm long, campanulate, with or without an extremely short stipe, glabrous or with a few hairs, conspicuously glandular; calyx lobes in markedly unequal pairs, white or cream, the color contrasting with the darker hypanthium, glabrous, conspicuously glandular, the margins entire, the apex rounded, the outer pair 1–1.5 × 1.5 mm, the inner pair 2–3.5 × 2.5 mm; petals 5 × 2–3 mm, oblong, the margins entire or with a few hairs, the apex rounded; disk 2 mm, with a few, tufted hairs; stamens 40 to 50, 4.5–7 mm long; style 7–8 mm long, glabrous. Fruits 10–25 × 10–14 mm, irregularly ellipsoid or globose, the base often substipitate; pericarp thick, fleshy, prominently glandular, glabrous or with a few hairs, the calyx persistent; mature color red.

Habitat, distribution, and phenology. Dry forests along the Pacific slope in Costa Rica at elevations of 500–1000 m. Collected in flower in December–January; collected in fruit March–April.

The elliptic to obovate leaves and fasciculate inflorescences of *Eugenia riosae* are similar to those of the Guatemalan species *E. vesca* Lundell. However, in *E. vesca* the vestiture is composed solely of simple hairs, the flowers and fruits are subtended by broadly ovate bracteoles that are connate at the margins, and the fruits are globose, 5–8 mm in diameter.

Etymology. The epithet honors Petrona Rios, the collector of the type, a parataxonomist for the Instituto Nacional de Biodiversidad, Costa Rica.

Paratypes. COSTA RICA. **Alajuela:** PN Rincón de La Vieja, Camino a Colonia Blanca, entre Quebrada Rancho Grande y finca Los Mora, *G. Rivera 1184* (CR, F, INB, MO); Upala, PN Guanacaste, Cordillera de Guanacaste, Estación San Ramón, Sendero el Nispero, *F. Quesada 288* (CR, F, INB, MO). **Guanacaste:** La Cruz, PN Guanacaste, Est. Pitilla, Sendero los Memos, *E. Alfaro 182* (CR, F, INB, MO); Tilarán ZP Tenorio, Tierras Morenas, Río San

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Figures 29, 30. —29 (left). *Eugenia riosae* Barrie (*Ríos 257*; holotype, INB). —30 (right). *Eugenia sancarlosensis* Barrie (*Jiménez et al. 1023*; holotype, CR).

Lorenzo, *C. Alvarado 115* (CR, INB, K); Tilarán, Cordillera de Tilarán, Palmital, Quebrada Malanga, Río Caño Negro, *E. Bello & E. Cruz 4884* (INB), *E. Bello & E. Cruz 4893* (CR, INB); Liberia, PN Guanacaste, Nueva Zelandia, Est. San Ramón, Sendero al Níspero, *D. García 153* (INB, MO); PN Guanacaste, Estación Pitilla, Fila Orosilito y Sendero El Mismo, *P. Ríos 322* (CR, INB, MO); Tilarán ZP Tenorio Tilarán, Cord. de Guanacaste, Tierras Morenas, alrededores Río San Lorenzo, *G. Rodríguez 141* (CR, F, INB, MO); Tilarán ZP Tenorio Tilarán, Cord. V. Tilarán, Tierras Morenas, Río San Lorenzo, *G. Rodríguez & Q. Jiménez 82* (F, INB, MO). **Heredia:** Sarapiquí Horquetas, Est. El Plástico, 15 km de Horquetas, Sendero El Tigre, *J. Sánchez et al. 311* (CR, F).

Eugenia sancarlosensis Barrie, sp. nov. TYPE: Costa Rica. Alajuela: San Carlos, 7 km al N de Boca Tapada, Finca Hogar de Ancianos, 24 Sep. 1991 (fl), *Q. Jiménez et al. 1023* (holotype, CR; isotypes, CR, F, INB, MO). Figure 30.

Ab *Eugenia herrerae* foliis cum costa planiuscula, floribus cum hypantio globoso, bracteolis apicibus caducis, basibus connatis, persistentibus, incrassatis differt.

Large trees, to 35 m or more; young growth not seen; branchlets terete, the nodes swollen; bark drying dark reddish purple, thinly pubescent with erect, simple hairs, ca. 0.5 mm. Leaves narrowly elliptic, the blades 13–20 × 3–6 cm, 3 to 4 times as long as wide, chartaceous or subcoriaceous, drying a dull olive above, yellow-green below, the midvein tan, flat or with 1 or 2 thin, parallel ridges above, convex below; lateral veins 10 to 18 per side, raised below; marginal veins similar to the laterals and arched between them, 3–4 mm from the margins; both surfaces of mature blades glabrous; glands obscure above, small and scattered below; base cuneate; margins entire; apex acuminate; petioles 5–8 mm long, reddish purple, similar to the branchlets, flattened or concave dorsally. Inflorescences axillary or possibly cauliflorous, fasciculate; flowers 8 to 12; bracts reduced or absent; buds not seen. Flowers pedicellate, the pedicels 10–15 mm long, glabrous; bracteoles connate and thickened at the base, the basal portion ultimately forming a ring beneath the hypanthium and developing fruit, the apex 0.5 × 0.5 mm, triangular, deciduous at anthesis, the margins ciliate, the apex acute; hypanthium ca. 4 mm long, globose, probably glabrous; calyx lobes in subequal pairs, 3–3.5 × 2 mm, triangular, fused basally, forming a short tube ca. 1 mm long, the outer surface glabrous, the inner surface densely pubescent, the hairs 0.1–0.2 mm, appressed, the margins entire, the apex acute; corolla not seen; disk 3–3.5 mm long, glabrous; stamens ca. 150; style ca. 5 mm long, glabrous. Immature fruits 10 × 10 mm, globose, constricted beneath the calyx; pericarp thick and fleshy, glabrous; calyx persistent, spreading, mature color unknown.

Habitat, distribution, and phenology. Known from the wet lowland forests on the Atlantic slope in northeastern Costa Rica and adjacent Nicaragua at elevations of 0–300 m. Collected in flower in September.

Eugenia sancarlosensis is similar to *E. herrerae* in having red young growth and petioles. This is a much larger tree, however, with branchlets that are often swollen at the nodes and leaves with a flat, rather than incised, midvein. The globose hypanthium is subtended by connate bracteoles with deciduous tips. After the tips have fallen, the persistent bases form a distinctive ring beneath the flower.

Paratypes. COSTA RICA. **Alajuela:** San Carlos, Llanura de San Carlos, Pital, Boca Tapada, Finca Hogar de Ancianos, *N. Zamora & A. Zeledón 2352* (INB); San Carlos Llanura de San Carlos, Boca Tapada, Finca Aserradero San Jorge, *N. Zamora 2357* (INB). NICARAGUA. **Atlántico del Sur:** Bluefields, Sitio Fonseca, aprox. 62 km al NE a lo largo del Río Kama, *N. Zamora & M. Castrillo 2049* (INB).

Eugenia selvana Barrie, sp. nov. TYPE: Costa Rica. Heredia: Finca La Selva, the OTS field station on the R. Puerto Viejo just E of confluence with R. Sarapiquí, betw. Arboretum & Near Loop Trail, 14 May 1980 (fl), *B. Hammel 8662* (holotype, MO; isotype, F). Figure 31.

Eugeniae venezuelensi aemulans, sed indumento puberulo, lobis calycis anguste triangulis, pallidis, fructibus 12–15 mm diametro differt.

Trees to 10 m or more; branchlets and inflorescences minutely puberulent, the hairs 0.1–0.2 mm, simple, erect; emergent leaves puberulent along the midvein and margins; branchlets compressed, slender; bark brown, smooth, puberulent. Leaves elliptic to ovate, the blades 4–9 × 1.5–3 cm, 2.5–3 times as long as wide, chartaceous, drying dark green above, pale green below; midvein depressed above, convex below; lateral veins 6 to 7 per side, plus a few intermediates, strongly curving-ascending, prominent on the lower surface; marginal veins similar to the lateral veins and strongly arched between them, 2–3 mm from the margins; upper surface persistently puberulent along the midvein, the lower surface with scattered hairs along the midvein and the lateral veins, the margins ciliate, sometimes along the lower half only; glands obscure above, numerous, small and dark below; base cuneate; margins entire; apex acuminate to cau-

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Figures 31, 32. —31 (left). *Eugenia selvana* Barrie (*Hammel 8662*; holotype, MO). —32 (right). *Eugenia shimishito* Barrie (*Reyna 733*; holotype, MICH).

date-acuminate; petioles 1–3 mm long, flattened or concave dorsally, persistently puberulent. Inflorescences axillary, solitary, short-racemose, persistently puberulent; axis 1–4 mm long; flowers 2 to 6; bracts 0.5 mm long, persistent at least through anthesis, elliptic, puberulent on the outer surface, the margins ciliate, the apex acute; buds 1.5–2 mm long, globose. Flowers short-pedicellate, the pedicels 1 mm long, persistently puberulent; bracteoles 0.3–0.7 × 0.3 mm, persistent, ovate or ellipsoid, puberulent, the base free, the margins ciliate, the apex acute; hypanthium 1 mm long, campanulate; calyx lobes in subequal pairs, 1.5–2.5 × 0.5 mm, narrowly triangular, white and somewhat petaloid, glabrate, the margins ciliate, the apex acuminate, the tip sharply pointed; petals 2–3 × 1–2 mm, elliptic, concave, the margins ciliate, the apex rounded; disk 1–1.5 mm diam., with scattered, minute hairs; stamens 20 to 25, 3–5 mm long; style 5–7 mm long, glabrous. Fruits 12–15 × 12–15 mm, globose or subglobose; pericarp thin-walled, glandular, glabrous; calyx persistent but inconspicuous; mature color unknown.

Habitat, distribution, and phenology. Lowland wet forests on the Atlantic slope of Costa Rica at elevations below 100 m. Collected in flower May–June; collected in fruit July–February.

The leaves and short-racemose inflorescence with nearly sessile flowers are similar to those of *Eugenia venezuelensis* O. Berg, a species found in Panama and from Nicaragua to Chiapas, Mexico, but which is not known from Costa Rica. *Eugenia selvana* differs in the minutely puberulent vestiture of hairs 0.1–0.2 mm long and the narrowly triangular, sharply pointed calyx lobes. The vestiture of *E. venezuelensis* is a denser covering of longer, 0.5–1 mm, straight and recurved hairs, and the calyx lobes are rounded.

Paratypes. COSTA RICA. **Heredia:** Sendero entre el campamento Canta Rana y R. Peje, Magsasay, *I. A. Chacón 79* (CR, MO); S of Puerto Viejo, 2 km S of Magsasay Penal Colony, W of the road, *N. Garwood et al. 1155* (BM, CR, F, MEXU, MO); Finca La Selva, Puerto Viejo de Sarapiquí, at edge of forest along W boundary, W of Research Trail, *M. H. Grayum 1990* (F, MO); La Selva, Río Sarapiquí near Puerto Viejo, jct. SSO & LOC trails, *A. Gentry & R. Ortiz 78554* (F); Magsasay, near La Selva, Transect 10, *A. H. Gentry et al. 71700A* (MO); Magsasay, near La Selva, Transect 10, *A. H. Gentry 71778A* (MO); Finca La Selva, the OTS field station on the R. Puerto Viejo just E of confluence with R. Sarapiquí, E River Rd., 620 S × 1220 E m grid, *B. Hammel 9184* (F, MO); Sarapiquí, Finca La Selva, Puerto Viejo, W boundary, along Hunter's pejibayes, *G. S. Hartshorn 1241* (F, MO, NY); Sarapiquí, Finca La Selva, Puerto Viejo, W boundary, along Hunter's pejibayes, *G. S. Hartshorn 1306* (CR, F, MO, NY); along Starkey Road, 4.5 km SW of bridge at Puerto Viejo, *W. D. Stevens 13488* (CR, MO). **Limón:** Bri-Bri, *L. J. Poveda 1153* (F, MO).

Eugenia shimishito Barrie, sp. nov. TYPE: El Salvador. Santa Ana: cloud forest of Montecristo, 5 Jan. 1979 (fl, fr), *M. L. Reyna 733* (holotype, MICH; isotype, MICH). Figure 32.

Ab *Eugenia glandulosopunctata* indumentis sericeis, fructibus duplo longioribus differt.

Shrubs or small trees; new growth sparsely sericeous, with simple, silky hairs; branchlets terete or weakly compressed; bark tan or gray, glabrate. Leaves ovate, the blades 4–7 × 2–3 cm, 2.2–2.5 times as long as wide, chartaceous, drying concolorous green, the midvein tan below; midvein sulcate above, convex below; lateral veins 12 to 14 per side, plus intermediates, prominent on both surfaces; marginal veins similar to the laterals and arched between them, 1–2 mm from the margins; glabrate; glands obscure on both surfaces; base cuneate; margins decurrent into the inner edge of the petiole; apex acuminate or caudate-acuminate; petioles 5–7 mm long, channeled or sulcate dorsally, glabrate or with a few, scattered hairs. Inflorescences axillary, fasciculate or very short-racemose, solitary, glabrate or with a few, persistent hairs, axis 0–1 mm long; flowers 2 to 4; bracts to 0.5 mm long, probably persistent but minute, glabrate, the margins entire, the apex acute; buds 4–5 mm long, obovoid. Flowers pedicellate, the pedicels 10–20 mm long, gracile, with a few appressed hairs; bracteoles 1–1.5 × 0.3 mm, persistent through anthesis but absent in fruit, lanceolate, the back keeled, the base free, the margins ciliate, the apex acute; hypanthium 1–2 mm long, campanulate, sparsely sericeous; calyx lobes in subequal pairs, 2–2.5 × 2 mm, triangular, glabrate, the margins ciliate, the apex bluntly acute; petals 3–5 × 2.5–3.5 mm, ovate, the margins entire, the apex rounded; disk 2–2.5 mm diam., coarsely pubescent; stamens ca. 80, 4–5 mm long; style 5 mm long, glabrous. Fruits 35–45 × 15–20 mm, ellipsoid, the base and apex abruptly attenuate; pericarp thin-walled, glandular, glabrous; calyx lobes usually persistent, reflexed; mature color pale yellow.

Habitat, distribution, and phenology. Known only from the cloud forest atop Cerro Montecristo, Santa Ana province, El Salvador, at elevations of 1900–2300 m. Collected in flower in January; collected in fruit in September.

Eugenia shimishito is distinguished by the sericeous emergent growth, the few-flowered inflorescences, and the flowers and fruits on pedicels 10–20 mm long. The fruits are similar in shape to those

of the Costa Rican species *E. glandulosopunctata*, but twice as large. That species also has prominent, pellucid glands on the leaves, flowers, and fruits.

Etymology. The epithet "shimishito" is, according to the label on the type, the local vernacular name for this species. As a noun in apposition, it retains its original gender.

Paratypes. EL SALVADOR. **Santa Ana:** San José Ingenio, P.N. Montecristo, la quebrada del pico gordo, *V. M. Martínez 599* (LAGU, MO); San José Ingenio, P.N. Montecristo, parqueo, *V. M. Martínez 734* (LAGU, MO); bosque nebuloso Montecristo, sendero a Cerro Brujo, *M. L. Reyna 1408* (MO).

Eugenia tilarana Barrie, sp. nov. TYPE: Costa Rica. Puntarenas: Monteverde, Reserva Biológica, 8 Aug. 1971 (b, fl), *L. J. Poveda 1111* (holotype, CR; isotypes, F, MO). Figure 33.

Ab *Eugenia guatemalensi* inflorescentiis majoribus, fructibus ellipsoidalibus vel obovoideis, costatis differt.

Trees to 20 m or more; young growth coppery appressed-pubescent, the hairs dibrachiate; branchlets compressed; bark tan or brown, smooth, glabrate. Leaves elliptic or obovate, the blades 5–9 × 2.5–3.5 cm, 2.0–2.6 times as long as wide, chartaceous, drying a nearly concolorous, dark green or paler below; midvein sulcate above, convex or raised below; lateral veins 8 to 10 per side, prominent on both surfaces, ascending and weakly if at all curved; marginal veins similar to the laterals and arched between them, 1–2 mm from the margins; both surfaces soon glabrate; glands on both surfaces raised, numerous and small, or obscure above; base cuneate; margins entire, flat or weakly down-turned near the base, decurrent along the petiole; apex acuminate, the acumen 5–15 mm long; petioles 5–10 mm long, sulcate dorsally, glabrate or with a few persistent hairs. Inflorescences axillary, racemose, solitary or 2 superposed, the axis, bracts, and buds uniformly coppery appressed-pubescent; axis 5–15 × 1–2 mm long, 4-angled in flower, terete in fruit; flowers 6 to 10; bracts 0.5–1 mm long, persistent through anthesis, cymbiform, spreading, the apex acute; buds 3–4 mm long, obovoid, costate. Flowers pedicellate, the pedicels 4–8 mm long, 4-angled, the pedicels, bracteoles, hypanthium, and calyx uniformly appressed-pubescent; bracteoles persistent, free or more commonly partially or wholly fused, forming an involucre 1–1.5 mm diam., dilated at anthesis, the inner surface glabrate, the margins scarious, the apex acute; hypanthium 2.5–3 mm long, campanulate, costate; calyx lobes in strongly unequal pairs, widely ovate, appressed-pubescent on both surfaces, the margins ciliate, the apex rounded, the smaller pair 0.7–1 × 2–3 mm, the larger pair 2–3 × 2.5–3 mm; petals 2.5–3.5 × 1.5–2.5 mm, elliptic or ovate, convex, the margins ciliate, the apex rounded; disk 2.5–3 mm diam., glabrous or with scattered, erect hairs; stamens 70 to 100, 3–6 mm long; style 4–6 mm long, glabrous. Fruits 25–35 × 15–20 mm, ellipsoid or obovoid, the base commonly attenuate, the apex obtuse; pericarp thin-walled, ribbed, glandular, uniformly but thinly pubescent; disk expanded, 5–6 mm diam.; calyx typically absent; mature color black.

Habitat, distribution, and phenology. Montane forests along the Continental Divide in central and northern Costa Rica at elevations of 900–1600 m. Collected in flower June–November; collected in fruit July–December.

A large tree of montane forests, *Eugenia tilarana* is the second of the three species newly described here that have been commonly identified as either *E. octopleura* or *E. guatemalensis*. It differs from the latter in having larger (25–35 vs. 5–12 mm long), ribbed, ellipsoid or obovoid fruits. The fruits also distinguish it from *E. monteverdensis*, which has unribbed, tan fruits.

Paratypes. COSTA RICA. Vertiente Pacífico, Reserva Monteverde, Cordillera de Tilarán [covers parts of Alajuela, Puntarenas, and Guanacaste], *V. J. Dryer 1057* (CR, F). **Alajuela:** San Ramón, RB Monteverde, Cordillera de Tilarán, Valle del Río Peñas Blancas, Quebrada El Valle, *E. Bello & E. Cruz 5204* (CR, F, INB, MO); Monteverde Cloud Forest Reserve, Peñas Blancas R. valley on Atlantic slope, *W. A. Haber & E. Bello 5817* (MO). **Guanacaste:** R. Chiquito de Arenal, Tilaran, Altos de San Bosco, 10 km NW Monteverde, Atlantic slope, *W. A. Haber et al. 5563* (MO). **Puntarenas:** San Luis, Monteverde, Finca de Chepe Rojas, al Oeste del pueblo, *E. Bello et al. 61* (CR, MO), *E. Bello et al. 117* (CR, F, MO); in & around the Monteverde Nature reserve, mostly on the Pacific watershed, *W. C. Burger & R. Baker 9653* (CAS, CR, F); Monteverde, upper community nr. Casona, Tract X, Pacific slope, *W. Haber & W. Zuchowski 10814* (CR, F, MO); Mata's Pasture, Monteverde, *G. S. Hartshorn 1781* (F, MO, NY).

Eugenia verruculata Barrie, sp. nov. TYPE: Costa Rica. Puntarenas: Monteverde, Reserva Biológica, 4 Apr. 1990 (fl), *W. Haber 9833* (holotype, INB; isotypes, F, MO). Figure 34.

Eugeniae costaricensi aemulans, sed floribus majoribus, fructibus verruculatis, carnosioribus differt.

Trees to 7 m or more; young branches, emergent leaves, and developing inflorescences coarsely pubescent with simple, straight or contorted, coppery hairs, 0.2–0.5 mm; branchlets terete; bark tan or brown, quickly graying, glabrate, slightly flaky.

33

34

Figures 33, 34. —33 (left). *Eugenia tilarana* Barrie (*Poveda 1111*; holotype, CR). —34 (right). *Eugenia verruculata* Barrie (*Haber 9833*; holotype, INB).

Leaves elliptic, the blades 2–5 × 1–2.5 cm, twice as long as wide, coriaceous, drying dark green above, paler below; midvein weakly impressed or sulcate above, convex below; lateral veins 7 to 9 per side, often partially obscure above; marginal veins similar to the laterals and arched between them, ca. 1 mm from the margins; both surfaces glabrate; glands typically obscure on the upper surface, small, pellucid on the lower surface; base cuneate; margins somewhat cartilaginous, decurrent into the inner edge of the petiole; apex acute to acuminate; petioles 4 mm long, channeled dorsally, becoming corky and fissured with age, glabrate. Inflorescences axillary or at leafless nodes, racemose, solitary; axis 1–2 mm, glabrate or with a few, scattered hairs; flowers (1)2 to 8; bracts 0.5 mm long, persistent, cymbiform, glabrate, the margins ciliate, the apex acute; buds 2.5–3 mm long, obconic. Flowers pedicellate, the pedicels 1–4 mm long, glabrate, glandular, in bud and flower; bracteoles ca. 1 × 1 mm, persistent, ovate, glabrate, the base free, commonly clasping the stipe, the margins ciliate, the apex rounded or obtuse; hypanthium 1.5 mm long, campanulate, the base commonly elongated into a stipe, ca. 1 mm, glabrate; calyx lobes in subequal pairs, 1–1.5 × 1.5–2 mm, widely elliptic, the margins ciliate, the apex rounded; petals 3.5 × 3 mm, elliptic, the margins ciliate, the apex rounded; disk 2–2.5 mm diam., glabrous; stamens 70 to 80, 3–5 mm long; style 5–6 mm long, glabrous. Fruits 10–15 × 10–15 mm, globose, with or without a short stipe; pericarp somewhat fleshy, prominently glandular-verruculate; calyx persistent but inconspicuous; mature color purple-black.

Habitat, distribution, and phenology. Known only from the montane wet forests of central Costa Rica at elevations of 1500 m. Collected in flower April–May; collected in fruit May–January.

Eugenia verruculata is similar to *E. costaricensis*, but may be distinguished by several floral and fruit characters. Although both species have sessile or short-racemose inflorescences, the pedicels of *E. verruculata* are generally shorter, 1–4 mm versus 2–8 mm. The bracteoles are ovate with rounded or obtuse apices and the hypanthium is campanulate. In *E. costaricensis* the bracteoles are commonly keeled, with acuminate apices, and the hypanthium is urceolate. The fruits of *E. verruculata* are ⅔ the size of those of *E. costaricensis*, and have a thicker, fleshier pericarp with a warty texture.

Etymology. The epithet refers to the glandular verruculate fruits of this species.

Paratypes. COSTA RICA. Reserva Monteverde, Cordillera de Tilarán [covers parts of Alajuela, Puntarenas, and Guanacaste], *V. J. Dryer 1353* (F, MO). **Puntarenas:** Guacimal, Altos de Río Veracruz, Finca Brenes, *E. Bello 1798* (CR, F, MO); San Luis, Monteverde, Camino a Veracruz, *A. Fernández 430* (F, INB, MO); Monteverde, bullpen on John Campbell farm, *W. Haber & J. Atwood 9613* (CR, K); Monteverde, upper community *W. Haber 292* (MO); Monteverde, upper community near reserve, Pacific slope wet forest, bullpen *W. Haber 10610* (CR, F, MO, SEL); Monteverde, upper community, on farms of Wolf Guindon & John Campbell, Pacific slope, *W. Haber et al. 10988* (INB).

Eugenia zuchowskiae Barrie, sp. nov. TYPE: Costa Rica. Puntarenas: Monteverde, Pacific slope in community, 24 July 1990 (fr), *W. Haber & W. Zuchowski 10036* (holotype, CR; isotypes, CR, F, MO). Figure 35.

Eugeniae tilaranae aemulans, sed foliis cum petiolis longioribus, apicibus caudato-acuminatis vel falcatis, fructibus minoribus differt.

Trees to 20 m or more; young growth coppery appressed-pubescent, the hairs dibrachiate; branchlets terete; bark dark reddish brown, smooth, glabrate. Leaves elliptic to obovate, the blades 4.5–9 × 1.5–5 cm, 2–3 times as long as wide, subcoriaceous, drying dark, glossy green above, pale green or brown below; midvein sulcate above, raised below; lateral veins 5 to 7 per side, straight and ascending, typically obscure above on fresh material but apparent on dried leaves; marginal veins similar to the laterals and arched between them, 1–2 mm from the margins; upper surface glabrate, coppery hairs persistent on the lower surface, more densely near the base; glands typically obscure above, minute and numerous below; base cuneate; margins cartilaginous; apex caudate-acuminate, up to ⅓ of the total blade length, twisted or falcate; petioles 10–20 mm long, sulcate dorsally, glabrate or with a few, persistent hairs. Inflorescences axillary, racemose, solitary or rarely 2 superposed, the axis, bracts, and buds uniformly appressed coppery-pubescent; axis 4–20 mm long, 4-angled in flower, terete in fruit; flowers 4 to 10; bracts 0.5–1 mm, persistent through anthesis, cymbiform, spreading, the apex acute; buds obovoid, 3–4 mm long, costate. Flowers pedicellate, the pedicels 3–5 mm long, 4-angled; bracteoles 0.5–1 × 0.5–1 mm, persistent, dilated at anthesis, triangular, coppery appressed-pubescent, the base free or weakly connate, the margins scarious, the apex acute; hypanthium 1.5–2 mm long, obconic, costate; calyx lobes in unequal pairs, widely ovate, convex, appressed-pubescent on both surfaces, the margin entire, the apex rounded, the smaller pair 1–1.5 × 1–2 mm, the larger pair 2–3.5 × 2.5–3.5

Figure 35. *Eugenia zuchowskiae* Barrie (*Haber & Zuchowski 10036*; holotype, CR).

mm; petals 4 × 3 mm long, elliptic, the margins ciliate, the apex rounded; disk 2.5–3 mm diam., glabrous; stamens 75 to 100, 5–5.5 mm long; style 4–5.5 mm long, glabrous. Fruits 25–30 × 10–15 mm, ellipsoid; pericarp thin-walled, partially or wholly 8-ribbed, glandular, glabrate or with a few hairs; calyx persistent but reduced; mature color purple-black.

Habitat, distribution, and phenology. Montane forests along the Continental Divide in central Costa Rica at elevations of 1400–1600 m. Collected in flower May–October; collected in fruit March–August.

The third of the Monterverdean species often identified as either *Eugenia octopleura* or *E. guatemalensis*, *Eugenia zuchowskiae* is most easily distinguished from these two species, as well as from *E. monteverdensis* and *E. tilarana*, by the glossy leaves with caudate or falcate, somewhat twisted, apices. The lateral veins of fresh leaves are typically obscure on the upper surface, though they may be visible in dried specimens. The fruits are ellipsoidal and usually 8-ribbed.

Etymology. The epithet honors Willow Zuchowski, the co-collector of the type and a noted specialist on the flora of the Monteverde region.

Paratypes. COSTA RICA. **Puntarenas:** Reserva Biológica Monteverde, Río Guacimal, Comunidad-Reserva, Vertiente Pacífica, *E. Bello 2086* (CR, F, MO); Reserva Monteverde, Cordillera de Tilarán, en portrero ca. de Reserva, *V. J. Dryer 905* (CR, F, MO); Reserva Monteverde, Cordillera de Tilarán, en faja de bosque perturbado ca. de Reserva, *V. J. Dryer 1443* (CR); Reserva Monteverde, Cordillera de Tilarán, en portrero ca. de Reserva, *V. J. Dryer 1580* (CR, F, MO); Monteverde, upper community, *W. A. Haber 554* (MO); Monteverde, upper community, Pacific slope, T. Guindon farm and bullpen, *W. Haber et al. 9960* (INB); Monteverde, upper community nr. Casona, Tract X, *W. Haber & W. Zuchowski 10802* (CR, F, MO); in Mata's pasture, Monteverde, *G. S. Hartshorn 1776* (CR[3], F, MO, NY), *G. S. Hartshorn 1781* (CR); Los Ayotes, near Tilarán, *P.C. Standley & J. Valerio 45461* (F).

Acknowledgments. The research underlying this paper was conducted while in residence in the Botany Department of The Field Museum, Chicago, Illinois. I thank the department for its generous, continuing support. The Instituto Nacional de Biodiversidad supplied financial and logistical support for research in Costa Rica. Thanks to all the INBio staff, especially Nelson Zamora, Francisco Morales, and Barry Hammel. Bill Haber generously shared his knowledge of the Myrtaceae of the Monteverde region. Thanks to Lúcia Kawasaki, Bruce Holst, and Les Landrum for many enlightening and constructive discussions of Neotropical Myrtaceae. And many thanks to the curators of the herbaria who loaned specimens for this study, including A, BM, BR, CAS, CR, F, GH, HAL, INB, K, MEXU, MICH, MO, NY, P, SEL, TEX-LL, UC, and US.

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Two New Cauliflorous Species of *Daphnopsis* (Thymelaeaceae) from French Guiana and Surinam

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ABSTRACT. Two new cauliflorous species of *Daphnopsis* (Thymelaeaceae) from French Guiana and Surinam are described, illustrated, and their relationships discussed. A key to the species of Thymelaeaceae in French Guiana and Surinam is provided. *Daphnopsis granitica* Pruski & Barringer and *D. granvillei* Barringer grow on the granitic inselbergs of northern to southwestern French Guiana and adjacent Surinam. They are each characterized by brachyblasts from older stems, the absence of petaloid appendages, and the presence of orange fruits. *Daphnopsis granitica* is distinctive because of its narrowly oblanceolate leaves, while *D. granvillei* has broader, oblanceolate to obovate leaves.

RESUMEN. Se describe y ilustra dos nuevas especies caulifloras de *Daphnopsis* (Thymelaeaceae) de la Guyana Francesa y Surinam y se discute sus relaciones. Se presenta una clave para las especies de Thymelaeaceae de la Guyana Francesa y Surinam. *Daphnopsis granitica* Pruski & Barringer y *D. granvillei* Barringer crecen sobre lajas graníticas del norte al suroeste de la Guyana Francesa y la región adyacente de Surinam. Ambas especies se caracterizan por tener braquiblastos de los tallos viejos, por la ausencia de apéndices petaloides y por la presencia de frutos anaranjados. *Daphnopsis granitica* se diferencia por tener las hojas angostamente oblanceoladas, mientras que *D. granvillei* tiene las hojas más anchas y oblanceoladas a obovadas.

Key words: brachyblast, cauliflory, *Daphnopsis*, French Guiana, *Schoenobiblus*, Surinam, Thymelaeaceae, Thymelaeoideae.

Daphnopsis Martius (Thymelaeaceae: Thymelaeoideae) is a genus of 50 to 65 species native to the Neotropics (Barringer & Nevling, 2004; Herber, 2003 [2002]). Species are shrubs or small trees with small, tubular or campanulate, essentially apetalous, unisexual flowers with eight stamens, short calyx lobes, and a pseudomonomerous ovary. The genus was most recently revised by Nevling (1959, 1963).

The following species were discovered during exploration of isolated, granitic mountains of French Guiana by Jean-Jacques de Granville and his associates. In February 2003, a team from Utrecht University collected *Daphnopsis granvillei* in the Nassau Mountains of Surinam, 150 km west of Montagnes de la Trinité, French Guiana. These two new species are the first species of *Daphnopsis* described from French Guiana and Surinam. They are also the sole species of *Daphnopsis* with orange fruits, a feature previously considered diagnostic for the genus *Schoenobiblus* Martius.

Most specimens of each species described herein have been distributed to specialists using the family identifications of either Myrsinaceae or Erythroxylaceae. *Daphnopsis granitica* was known solely as a herbarium name of the second author, then at US, where it was revived by the first author. *Daphnopsis granvillei* Barringer was treated as *Daphnopsis* sp. 1 by Kawasaki and Mori (2002). The only other Thymelaeaceae reported from French Guiana or Surinam, *Schoenobiblus daphnoides* Martius, is distinguished by its rotate, deeply lobed calyces, and its four stamens. The key in Kawasaki and Mori (2002) is modified below.

KEY TO THE SPECIES OF THYMELAEACEAE IN FRENCH GUIANA AND SURINAM

1a. Flowers and fruits in terminal cymes; calyx tube shorter than the lobes; stamens 4 . . . . . *Schoenobiblus daphnoides* Martius

1b. Flowers and fruits in brachyblasts on older stems; calyx tube longer than the lobes; stamens 8.

2a. Leaves narrowly lanceolate, 1.7–3 cm wide; petioles to 2 mm long . . . . . *Daphnopsis granitica* Pruski & Barringer

2b. Leaves oblanceolate to obovate, 5–9 cm wide; petioles 4–7 mm long . . . . . *Daphnopsis granvillei* Barringer

We place *Daphnopsis granitica* and *D. granvillei* in subgenus *Neivira* (Grisebach) Nevling (Nevling, 1959), where they resemble the cauliflorous, Venezuelan *D. steyermarkii* Nevling. *Daphnopsis* subg. *Neivira* is characterized by monopodial stems with axillary inflorescences, male flowers with petaloid appendages forming a low ring at the mouth of the calyx tube, and deeply lobed nectary discs. The species from the Guayana Highland differ from the majority of the species in the subgenus, which grow in the mountains of southeastern Brazil, by the absence of petaloid appendages, and probably by having orange to yellow fruits. Further study will likely support recognition of a new subgenus for the cauliflorous species from the Guayana Highland.

Daphnopsis granitica Pruski & Barringer, sp. nov. TYPE: French Guiana. Montagnes de la Trinité, sommet nord alt. 400 m environ, forêt dense sur crête avec cahos granitiques en sous bois, 12 Jan. 1984, *J.-J. de Granville, C. Berg, M. Jansen-Jacobs & J. van Setten 5890* (holotype, CAY 009959; isotypes, NY, P not seen, U not seen, US 3205040). Figure 1.

Daphnopsi steyermarkii affinis, sed foliis brevipetiolatis, lamina anguste oblanceolata subcordata vel rotundata attenuata, fructibus aurantiacis diversa.

Shrubs to small trees to 4 m tall; stems monopodial, subterete, 2.5–5 cm diam., glabrous, bark brown, the terminal bud narrowly deltoid, 2–3 mm long. *Leaves* simple, alternate, clustered at the stem apices, estipulate, subsessile; petiole to 2 mm long, thick; blade narrowly oblanceolate, 11.5–25 × 1.7–3 cm, stiffly chartaceous or subcoriaceous, glabrous, venation pinnate, reticulodromous, basally rounded or subcordate, sometimes slightly clasping, apically attenuate, margins entire. *Staminate flowers* not seen. *Pistillate inflorescences* borne in axillary bracteate clusters (brachyblasts) on older, leafless stems, ca. 20–30 cm below the stem apices, the primary peduncle, rachis, and secondary peduncles basically absent, pedicels to 0.5 mm long, few- to several-flowered, compact. *Pistillate flowers* white; calyx urceolate, the tube 2–2.5 mm long, longitudinally pleated, glabrous to minutely pubescent, 4-lobed, the lobes ligulate, 0.8–1 × 0.5–0.7 mm, obtuse, pubescent toward the apex on the inner surface, longitudinally ridged on the inner surface, strongly recurved; petaloid appendages absent; staminodia absent; pistil fusiform, sessile, ca. 3 mm long, partially surrounded by a deeply-lobed, coroniform nectary disc; ovary superior, style terminal, stigma exserted, capitate, papillate, white. *Fruit* a drupe-like berry, indehiscent, 1-seeded, obovoid to subglobose, 8–10 mm diam. when mature, smooth, glabrous, green when young, orange at maturity, the style base persistent, the calyx tearing irregularly, persistent at the base of the fruit.

Distribution and habitat. This species is found at the base of the granite inselbergs Montagnes de la Trinité and Montagnes des Nouragues, where it has been collected between 110 and 400 m elevation.

Phenology. Plants flower in January and bear mature fruits from late February through early April.

Daphnopsis granitica appears to be related to *D. steyermarkii* Nevling, *D. guaiquimimae* Steyermark, and *D. longipedunculata* Gilg ex Domke, each of which also has monopodial branching and minute flowers borne in brachyblasts (Nevling, 1967; Steyermark, 1987). *Daphnopsis steyermarkii, D. guaiquimimae,* and *D. longipedunculata,* which occur on sandstone substrates in the Guayana Highland, differ from *D. granitica* by having broader leaves and white or green (not orange) fruits. *Daphnopsis granitica* is also similar to *D. granvillei* Barringer, described below, in having brachyblasts and orange fruits but differs from it by narrowly oblanceolate (vs. oblanceolate to oblong) leaves, these slightly (vs. not) clasping.

Specimens very similar to *D. granitica* have been seen by Lucia Rossi (pers. comm.), of the Instituto de Bôtanica, São Paulo. The specimens were collected in the states of Roraima and Amazonas, Brazil, and have slightly wider and more oblanceolate leaves than *D. granitica* and yellow fruits, these occasionally present near the stem apex. It is possible that these represent an additional new species, although this cannot be confirmed without flowering material.

Paratypes. FRENCH GUIANA. Montagnes de la Trinité, Bassin de la Mana, *G. Cremers 12824* (CAY, MO, NY, US); Rés. Nat. de la Trinité, Bassin de la Trinité, Fourré de savane-roche, *B. Dutrêve 50* (CAY); Inselberg granatique à l'extrèmité NordOuest de Monts de la Trinité, *J.-J. de Granville 4778* (CAY); Montagnes de la Trinité, Sommet Nord, *J.-J. de Granville, C. Berg, M. Jansen-Jacobs & J. van Setten 5803* (CAY, NY); forêt basse humide en lisière de savane roche, *J.-J. de Granville, C. Berg, M. Jansen-Jacobs & J. van Setten 5923* (CAY, NY); Montagnes de la Trinité, Bassin de la Mana, forêt basse sur pente d'inselberg, pied du versant Sud l'inselberg oriental, *J.-J. de Granville 13276* (CAY, US); Montagnes de la Trinité, zone sud, Bassin de la Mana, *J.-J. de Granville & F. Crozier 13560* (CAY, NY); Montagne des Nouragues, Bassin de l'Arataye, *D. Larpin 504* (CAY); Montagnes des Nouragues, Bassin de l'Approuague–Arataye, *D. Larpin 849*

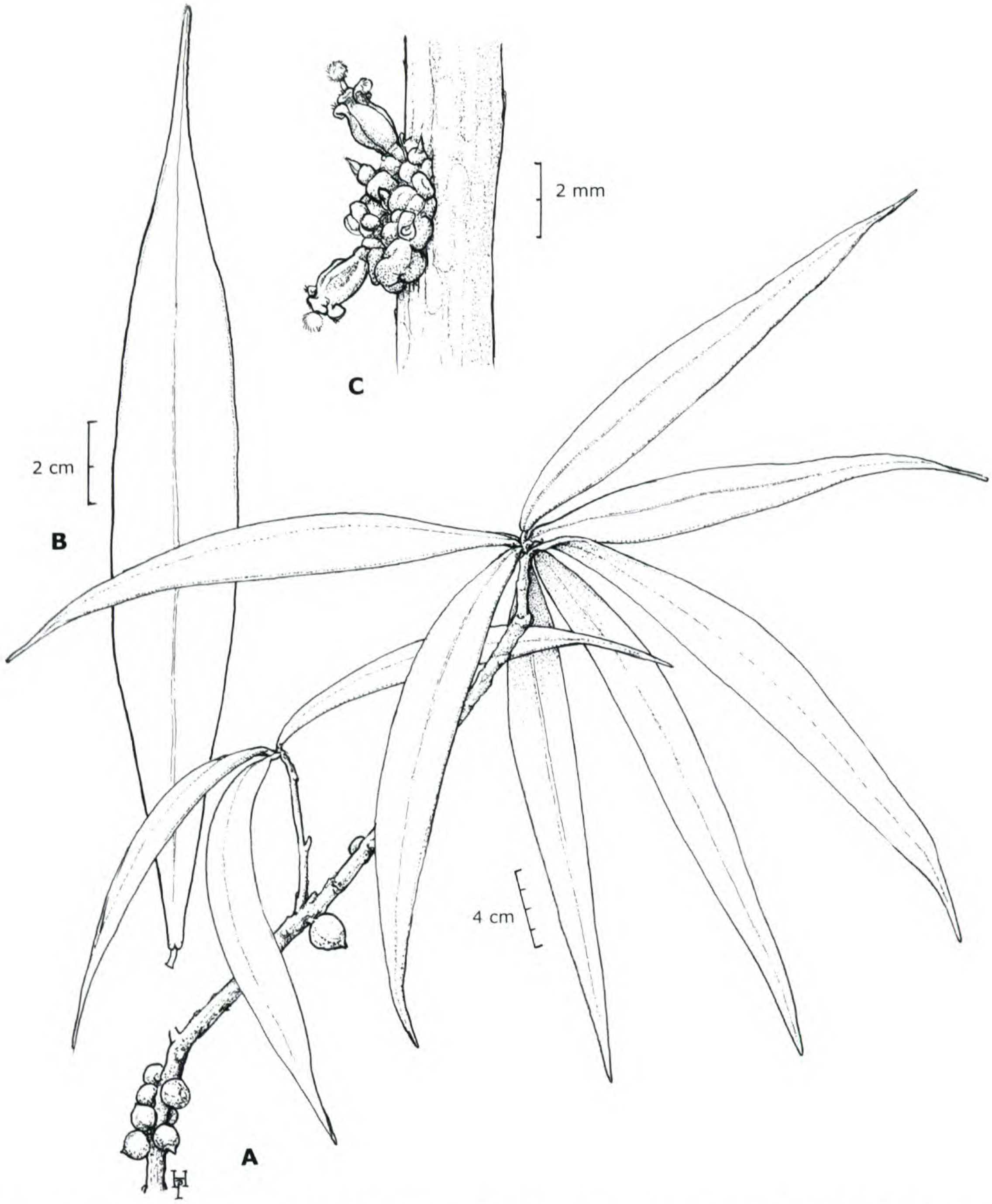

Figure 1. *Daphnopsis granitica* Pruski & Barringer. —A. Habit. —B. Leaf. —C. Brachyblast. Drawn from the holotype, *J.-J. de Granville et al. 5890* (CAY).

(CAY, NY, US); Inselberg Trinité, Savane-Roche, *J. Villiers & C. Sarthou 6284* (CAY).

Daphnopsis granvillei Barringer, sp. nov. TYPE: French Guiana. Saül, S. du Mont Galboa, 13 Dec. 1976, *J.-J. de Granville B.5402* (holotype, CAY 007764). Figure 2.

Daphnopsi steyermarkii affinis, sed foliis magnis oblanceolatis vel obovatis acuminatis, fructibus rubris vel aurantiacis diversa.

Sparsely branched, shrub to 2 m tall; stems monopodial, terete, to 2 cm diam., glabrous, the young stems red-brown. *Leaves* simple, alternate, clustered at the stem apices, estipulate, short-petiolate; petiole 4–7 mm long, thick, slightly winged on the abaxial side; blade oblanceolate to obovate,

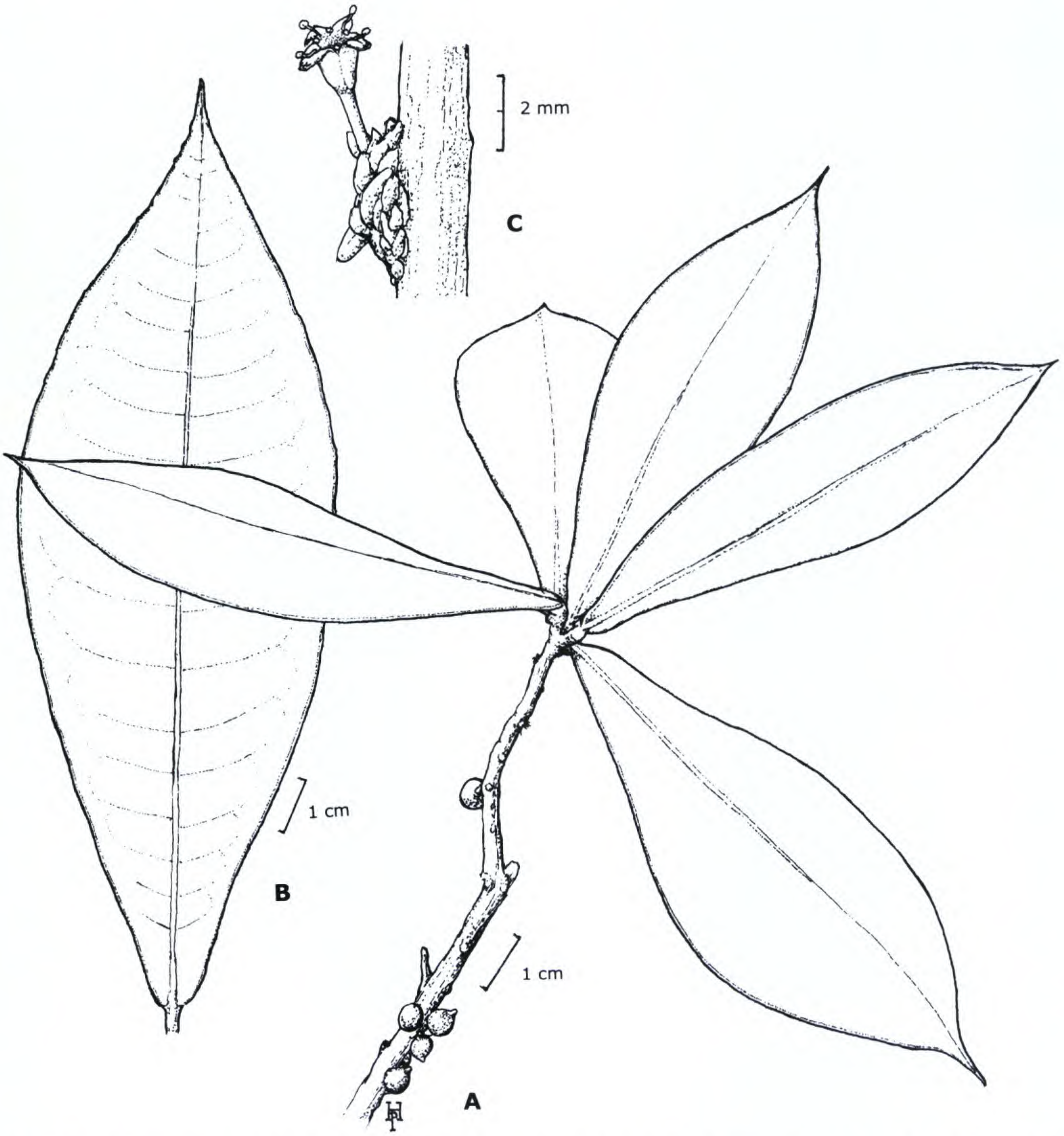

Figure 2. *Daphnopsis granvillei* Barringer. —A. Habit. —B. Leaf. —C. Brachyblast. Drawn from the holotype, *J.-J. de Granville B.5402* (CAY).

15–30 × 5–9 cm, subcoriaceous, glabrous, venation pinnate, reticulate, obscure, basally cuneate, but abruptly rounded at the junction with the petiole, apically long-acuminate, margins entire. *Staminate inflorescences* borne from axillary, bracteate brachyblasts on older, leafless stems, the primary peduncle to 1(2) mm long, rachis absent, secondary peduncles 1–1.5 mm long, pedicels 1.2–1.5 mm long, few-flowered, compact. *Staminate flowers* white; calyx tubular-campanulate, the tube 2.1–2.5 mm long, 1.5–2 mm wide at the mouth, 4-angled, especially in bud, the lobes triangulate to ovate, 0.5–0.7 mm long, 1 mm wide at the base, spreading, cymbiform in bud, apically acute to obtuse, acuminate with a small papillate knob; stamens 8, in 2 whorls, the antesepalous whorl borne on the surface of the calyx lobes near the apex, the filaments 0.5–0.7 mm long, the alternisepalous whorl borne at the mouth of the calyx tube, the filaments 0.3–0.5 mm long; disc free, deeply lobed, the lobes acute, to ca. 1 mm long; pistillode glabrous, stalked, 1.2–1.7 mm long. *Pistillate flowers* not seen. *Fruit* a drupe-like berry, ovoid, to 10 mm long, to 8 mm wide, reddish or orange, glabrous, apiculate, the style often persistent.

Distribution and habitat. This species grows on hilltop forests from 500 to 600 m elevation.

Phenology. Plants bloom in December and January and bear mature fruit in March.

This species is most similar to *Daphnopsis granitica*, described above. Like that species, the flowers of *D. granvillei* are borne in compact, axillary inflorescences on older, leafless stems and both have orange fruits, the only species where this is known. *Daphnopsis granvillei* grows at higher elevations and in more localities than *D. granitica*, but both are found on the Montagnes de la Trinité. The narrowly lanceolate, slightly clasping leaves of *D. granitica* are distinctive and make it easy to distinguish from *D. granvillei*.

Paratypes. FRENCH GUIANA. Montagne Cacao, SE de Cayenne, *C. Feuillet 549* (CAY); Région de Paul Isnard, Massif du Décou Décou, *C. Feuillet 689* (CAY); Pente NE des Monts Galboa, à 10 km SW de Saül, *J.-J. de Granville 2375* (CAY); Montagnes de la Trinité, sommet NE, in forest on slopes, *J.-J. de Granville et al. 6377* (CAY). SURINAM. Marowijne Distr., Nassau Mts., Plateau C, *M. J. Jansen-Jacobs, J. Behari-Ramdas, A. Grant, G. Ramharrakh, H. ter Steege, O. Bánki, F. van Troone & R. Ho Tsoi 6377* (MO, U not seen), *6484* (MO, U not seen).

Acknowledgments. We thank Jean-Jacques de Granville (CAY) as well as the curators of NY, U, and US for allowing us to study their specimens. We especially thank Dr. de Granville, Lucia Rossi (SP), and Scott Mori (NY) for checking for material of *Daphnopsis* among their duplicates and recent collections. We thank Zachary Rogers and Lucia Rossi for reviewing the manuscript, and Peter Stevens for helpful discussion. The illustrations were drawn by Paul Harwood (BKL).

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Staurogyne rubescens (Acanthaceae), a New Species from Southeastern Brazil

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ABSTRACT. A new species of Acanthaceae, *Staurogyne rubescens*, is described and illustrated. It is endemic to the Brazilian moist forests on the eastern range of mountains named "Serra do Mar" and is thus far known only from the states of Rio de Janeiro and São Paulo. *Staurogyne rubescens* can be distinguished by its lax terminal racemes, with bracts and bracteoles that are foliaceous, and the flowers that have a pink calyx and red corolla. *Staurogyne itatiaiae* (Wawra) Leonard also has red flowers and occurs in the highlands of the Atlantic rain forest. The distinguishing characters for these two species are presented in tabular format.

RESUMO. A nova espécie *Staurogyne rubescens* (Acanthaceae), endêmica da Serra do Mar nos Estados do Rio de Janeiro e de São Paulo, é descrita e ilustrada. *Staurogyne rubescens* é reconhecida pelo racemo terminal laxo, com brácteas e bractéolas foliáceas, e pelas flores com cálice rosado e corola vermelha. *Staurogyne itatiaiae* (Wawra) Leonard também apresenta flores vermelhas e ocorre em altitudes elevadas na floresta Atlântica. As características distintivas entre as duas espécies estão apresentadas em tabela.

Key words: Acanthaceae, Brazil, Nelsonioideae, *Staurogyne*.

Staurogyne Wallich comprises about 80 herbaceous or shrubby species (Wasshausen, 1995). Plants belonging to this genus may be recognized by flowers with the calyx formed by five unequal lacinia, the posterior larger than the others, the anterior pair of intermediate size, and the lateral pair smaller than the others; four stamens, usually didynamous, and with a staminode between the two posterior stamens; and stigma with usually one of the two lobes deeply concave or divided into two segments. *Staurogyne* is a pantropical genus and in the Americas, where it comprises ca. 28 species, it is widely distributed especially in South America; only one species reaches the subtropical areas of North America. In Brazil there are ca. 27 taxa, according to an undergoing taxonomic revision of *Staurogyne* (Braz & Monteiro, in prep.).

The subfamily Nelsonioideae Pfeiff of Acanthaceae, of which *Staurogyne* is the richest genus, can be recognized by the imbricate descending cochlear aestivation, and absence of hooklike retinacula in the capsules and cystoliths in the leaves (Scotland & Vollesen, 2000). Recent phylogenetic studies based on morphological and molecular data support the basal placement of Nelsonioideae as a sister group of the other Acanthaceae (Hedrén et al., 1995; Scotland et al., 1995; McDade & Moody, 1999; McDade et al., 2000; Scotland & Vollesen, 2000; Manktelow et al., 2001; Schwarzbach & McDade, 2002), showing no reason to treat them separately. In Brazil, *Elytraria* Michaux and *Nelsonia* R. Brown are the Nelsonioideae representatives that differ from *Staurogyne* in having 2-staminate flowers.

The Neotropical species of *Staurogyne* have infundibular flowers that are white or lilac-colored, sometimes purple-red maculate at the limb and throat, or narrowly tubular corollas that are red or yellow. In Brazil, *Staurogyne* species occur in humid and shaded habitats, especially close to water courses, in the gallery forests, in the cerrado biogeographic domain, but mainly in the understory of natural forest vegetation, in the Amazon and Atlantic rain forest domains.

Staurogyne rubescens D. M. Braz & R. Monteiro, sp. nov. TYPE: Brazil. Rio de Janeiro: Mun. Parati, subida para o Cuscuzeiro, 500 m.s.m., APA-Cairuçu, 28 Mar. 1995 (fl), *M. G. Bovini, L. C. Giordano, J. Miguel & J. C. Silva 724* (holotype, RB). Figure 1.

Ab omnibus speciebus generis inflorescentia racemo terminali, laxo, bracteis et bracteolis viridibus, floribus calyce roseo et corolla tubulosa rubescenti differt.

Herbs, 50–90 cm tall, stem cylindrical, erect or decumbent, scarcely branched, with scattered simple trichomes. Leaves elliptic, 3–10.3 × 1.1–3.2 cm, apex acute to somewhat acuminate, base acute to attenuate, upper surface glabrous or with scat-

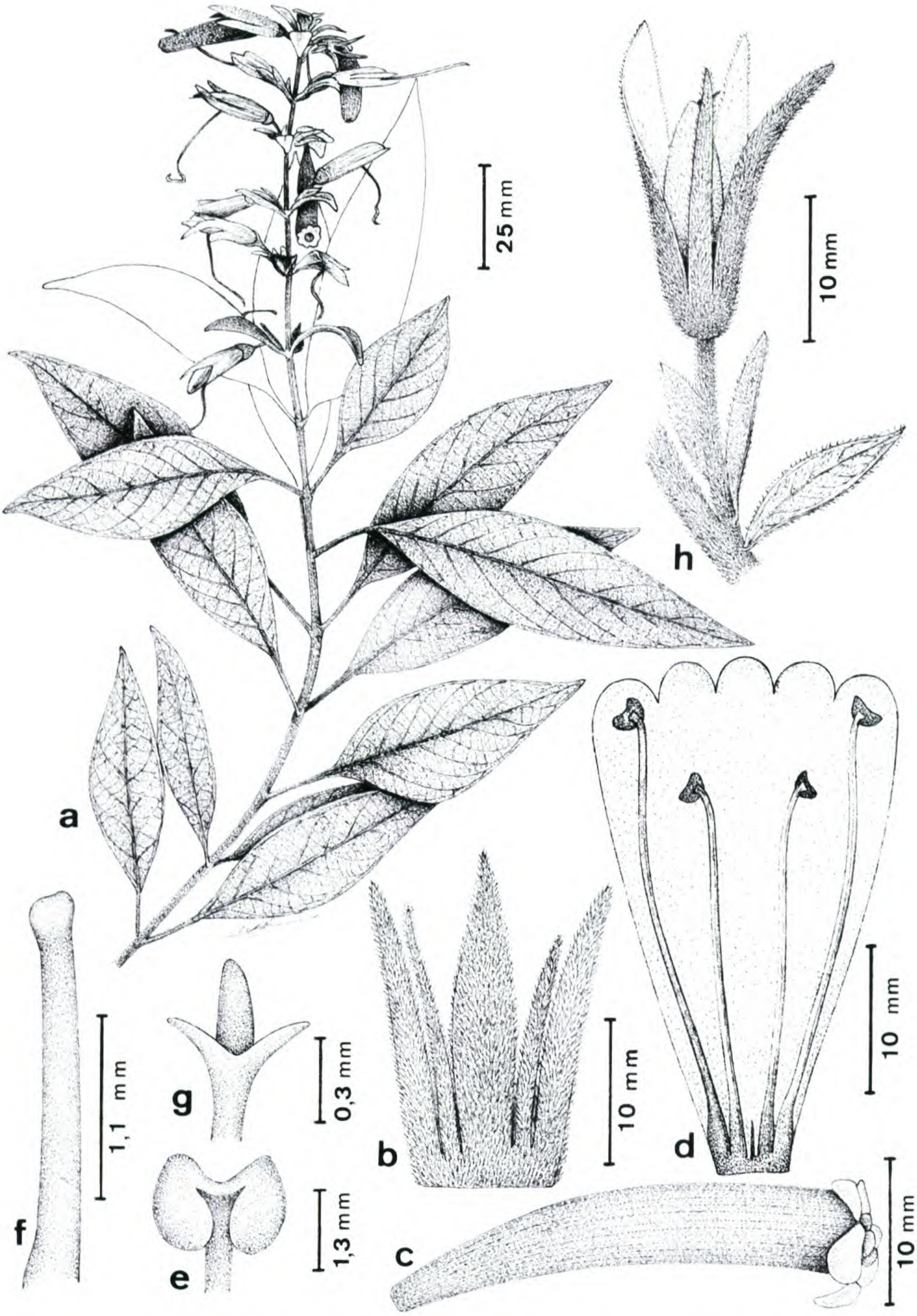

Figure 1. *Staurogyne rubescens* D. M. Braz & R. Monteiro. —a. Flowering stem. —b. Open calyx; external view with the posterior lacinia in the middle and the two pairs of lateral and anterior lacinias. —c. Corolla. —d. Open corolla, stamen, and staminode. —e. Anther. —f. Staminode. —g. Stigma with the deeply concave posterior lobe in first plane, and the anterior lobe at the back. —h. Bract, bracteoles, calyx, and immature fruit. Drawn from *Braz & Ressel 77* (HRCB).

Table 1. Comparative features of *Staurogyne rubescens* and *S. itatiaiae*.

Characters	*S. rubescens*	*S. itatiaiae*
Pairs of secondary veins of the leaf blade	8 to 10	12 to 16
Inflorescence	simple, terminal, lax	compound, terminal and axillary, congested
Bracts and bracteoles	green, pinnate venation	red to purplish, acrodromous venation
Pedicel length (mm)	3–9	0.8–2
Corolla length (mm)	29–36	16–20
Corolla lobe shape	oblong	orbicular
length (mm)	3–5	1.5–2
Stamen length (mm)		
posterior pair	17.5–26	5.5–8
anterior pair	18–27	7.5–9
Ovules (number) per locule	14 to 18	20 to 22
Style length (mm)	31–37	12–16
Stigma posterior lobe	deeply concave	truncate

tered simple trichomes at the base of the main vein, lower surface with scattered simple trichomes, especially at the veins; secondary veins 8 to 10 pairs; petiole 0.6–2.0 cm long. Inflorescence a raceme, terminal, leafy-bracteate, lax, simple, rachis with scattered glandular trichomes; peduncle 21–29 mm long; bracts foliaceous, 10–12 × 3–3.5 mm, the upper gradually smaller; bracteoles lanceolate, 4–12 × 0.8–2.1 mm, green, with pinnate venation; pedicel 3–9 mm long. Calyx pink, slightly purple-red near the margins, with scattered glandular trichomes, posterior lacinia elliptic to oblong-elliptic, 12–27 × 2–3.5 mm, apex acute, lateral pair subulate, 10–19 × 0.5–1.5 mm, anterior pair linear-lanceolate, sometimes slightly asymmetric, 12–20 × 1.3–2 mm, apex acute; corolla tubular, red to light pink, 29–36 × 4–7.3 mm, basal tube well defined, 2.5–6 mm long, throat 23.5–29 mm long, lobes oblong, anterior slightly orbicular, 3–5 mm long; stamens subexserted, inserted 3–4.5 mm above the corolla base, posterior pair slightly shorter (17.5–26 mm long) than the anterior (18–27 mm long), staminode straight, 2–2.8 mm long, apically truncate to antheriform, inserted slightly below the stamens; style 31–37 mm long, posterior lobe of the stigma deeply concave, with the sides slightly salient, anterior lobe longer, oblong, apex obtuse. Immature capsule white, becoming brown when mature, subterete, 14–16.5 × 5–4 mm, sparsely pilose; seeds 14 to 18 per locule, subglobose, glabrous.

Habitat, distribution, and phenology. *Staurogyne rubescens* is endemic to the Serra do Mar, occurring in the Atlantic rain forest, in the extreme south of Rio de Janeiro State (Parati municipal district), and in the state of São Paulo (Ubatuba municipal district). Plants occur in protected areas of the conservation units of APA Cairuçú (APA, *Área de Proteção Ambiental*), the ecological station of Joatinga, and the state park of Serra do Mar. *Staurogyne rubescens* is found in shaded and wet habitats, between 500 and 1080 m elevation. Plants flower between March and April.

Staurogyne rubescens can be recognized by its leafy-bracteate inflorescences, with bracts and bracteoles always green, and by its flowers with a pink calyx and red tubular corolla. With regard to the red corolla, *S. rubescens* is similar to *S. itatiaiae*, but it differs especially by the terminal lax inflorescence, with green bracts and bracteoles, and by the notably smaller habit, usually herbaceous; in *S. itatiaiae* the racemes are terminal and axillary, congested, the bracts and bracteoles are red, and the habit is shrubby (Table 1). *Staurogyne rubescens* is also similar to *S. minarum* (Nees) Kuntze in having a lax terminal raceme and green bracts and bracteoles. These species may be distinguished by habit (herbaceous in *S. rubescens* vs. fruticous in *S. minarum*), flower color (red vs. yellow), and also by having allopatric and restricted distributions, with *S. minarum* being only found in the state of Minas Gerais.

The name of the new taxon refers to its red corolla. *Staurogyne rubescens* and *S. itatiaiae* are the only American species that have tubular red corollas. Both species are almost entirely restricted to the Atlantic rain forest, above 500 m elevation. *Staurogyne itatiaiae* also reaches the "Serra da Mantiqueira," where it is widespread in the municipal district of Itatiaia, in Rio de Janeiro State, down to the "Serra da Bocaina," through which it ranges to São Paulo State, being the first record for

this state. *Staurogyne rubescens* occurs on coastal-facing slopes of the "Serra do Mar."

Paratypes. BRAZIL. **Rio de Janeiro:** Parati, Praia Negra, Pico do Cairuçu, Mata de Altitude, 25 Mar. 1992 (fl), *C. Farney & L. C. Silva, J. C. Silva 3123* (RB). **São Paulo:** Ubatuba, próximo à divisa com São Luiz do Paraitinga, 3 Abr. 2002 (fl), *D. M. Braz & K. Ressel 77* (HRCB); Ubatuba, próximo à divisa com São Luiz do Paraitinga, 3 Abr. 2002 (fl), *D. M. Braz & K. Ressel* 78 (HRCB, MO).

Acknowledgments. The authors are grateful to Tarciso Filgueiras for Latin corrections; to Massimo Bovini and Ronaldo Marquete for information about the locality of the type collection; to FAPESP (Fundação de Amparo à Pesquisa do Estado de São Paulo) for financial support; to the curators of the herbaria C, F, HB, MBM, R, RB, and RBR for loan of specimens; to Jaime Roberto Somera for the illustrations; to the professionals and/or friends who helped on field trips, Maria M. M. Braz, Hermann Schimitt, Alexandra M. S. Pitolli, Rita C. Koch, and especially to Kaila Ressel.

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New Taxa in Lythraceae from Latin America

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Abstract. Two new species, two new varieties, and two new combinations for Lythraceae from Bolivia, Brazil, Cuba, and Mexico are proposed. The new species are *Cuphea aquilana* from Mexico and *C. potamophila* from Brazil. The new varieties are *C. pulchra* var. *corollata* from Brazil and *Diplusodon virgatus* var. *occidentalis* from Brazil and Bolivia. *Cuphea sessilifolia* subsp. *bahiensis* is elevated to the rank of species. *Cuphea grisebachiana*, from Cuba, is reduced to varietal status as *C. parsonsia* var. *grisebachiana*, and the first report of its chromosome number is given. The range of *Cuphea xanthopetala*, previously known only from Mato Grosso, Brazil, is extended by discovery of the species in Amazonas, Brazil. Additional collections also expand the range of the recently described *Diplusodon bolivianus* in Santa Cruz, Bolivia, and Mato Grosso, Brazil.

Resumo. Duas novas espécies, duas novas variedades e duas novas combinaçõe para Lythraceae da Bolívia, Brasil, Cuba e México são propostas. As novas espécies são *Cuphea aquilana*, do México e *C. potamophila*, do Brasil. As novas variedades são *C. pulchra* var. *corollata*, do Brasil e *Diplusodon virgatus* var. *occidentalis*, do Brasil e Bolívia. *Cuphea sessilifolia* subsp. *bahiensis* é elevada ao estatus de espécie. *Cuphea grisebachiana* da Cuba é reduzida ao estatus varietal como *C. parsonsia* var. *grisebachiana* e o primeiro registro sobre o seu numero cromossômico é fornecido. A amplitude de distribuição de *C. xanthopetala*, previamente conhecida apenas para o Mato Grosso, Brasil, é extendida pela descoberta da espécie na Amazônia, Brasil. Coleçõe adicionais do Mato Grosso, Brasil, expandem também a distribuição conhecida de *Diplusodon bolivianus*, recentemente descrita para Santa Cruz, Bolívia.

Key words: Bolivia, Brazil, chromosome number, Cuba, *Cuphea*, *Diplusodon*, Mexico.

Collaborative revisionary and monographic studies under way in the Lythraceae have led to the discovery of several novelties in the most speciose genera, *Cuphea* P. Browne and *Diplusodon* Pohl. We describe two new species, two new varieties, and make two new combinations for members of floras from Bolivia, Brazil, Cuba, and Mexico. We also report range extensions for two recently described species of *Cuphea* and *Diplusodon*.

1. **Cuphea aquilana** S. A. Graham & T. B. Cavalcanti, sp. nov. TYPE: Mexico. Michoacán: Aquila, en Las Brisas del Mirador, 24 km al S de El Ranchito, 20 Oct. 1985, *J. C. Soto N. 11194* (holotype, MEXU; isotypes, MEXU, MO). Figure 1.

Herba annua delicatula, 30–35 cm alta. Folia petiolis 5–27 mm longis insidentia, 20–50 mm longa, 10–35 mm lata, ovata, cordata, supra sparse strigosa. Racemi simplices; pedicelli 2–5 mm longi, filiformes. Flores 1 in quoque nodo, 4–5 mm longi, sine calcare, dorsaliter remoti hispidi; lobus dorsalis quam ceterus amplior; petala 0; stamina inclusa, supra medium tubi inserta, tubo distincte breviora; ovula 2; discus nectarifer curvus super ovarium, crassus, ligulatus. Semina elliptica, 2.2–2.4 mm longa, margine arguta cincta.

Herbaceous annuals, or possibly suffrutescent, short-lived perennials, 30–35 cm tall, erect, stems slender to nearly filiform, much branched, the branches varying in length, some as long as the primary stem, bearing thin, weak, colorless or purple glandular trichomes of varying lengths to 0.5 mm long; internodes mostly shorter than the subtending leaves but internodes, leaves, and petioles highly variable in length. Leaves opposite, petioles 5–27 mm long; blades 20–50 × 10–35 mm, thinly membranous, ovate, base shallowly to deeply cordate, apex acute to acuminate, margin plane; blade surfaces sparsely strigose above, glabrous below except for minute trichomes on the veins; leaves gradually reduced in size toward the stem apex to form

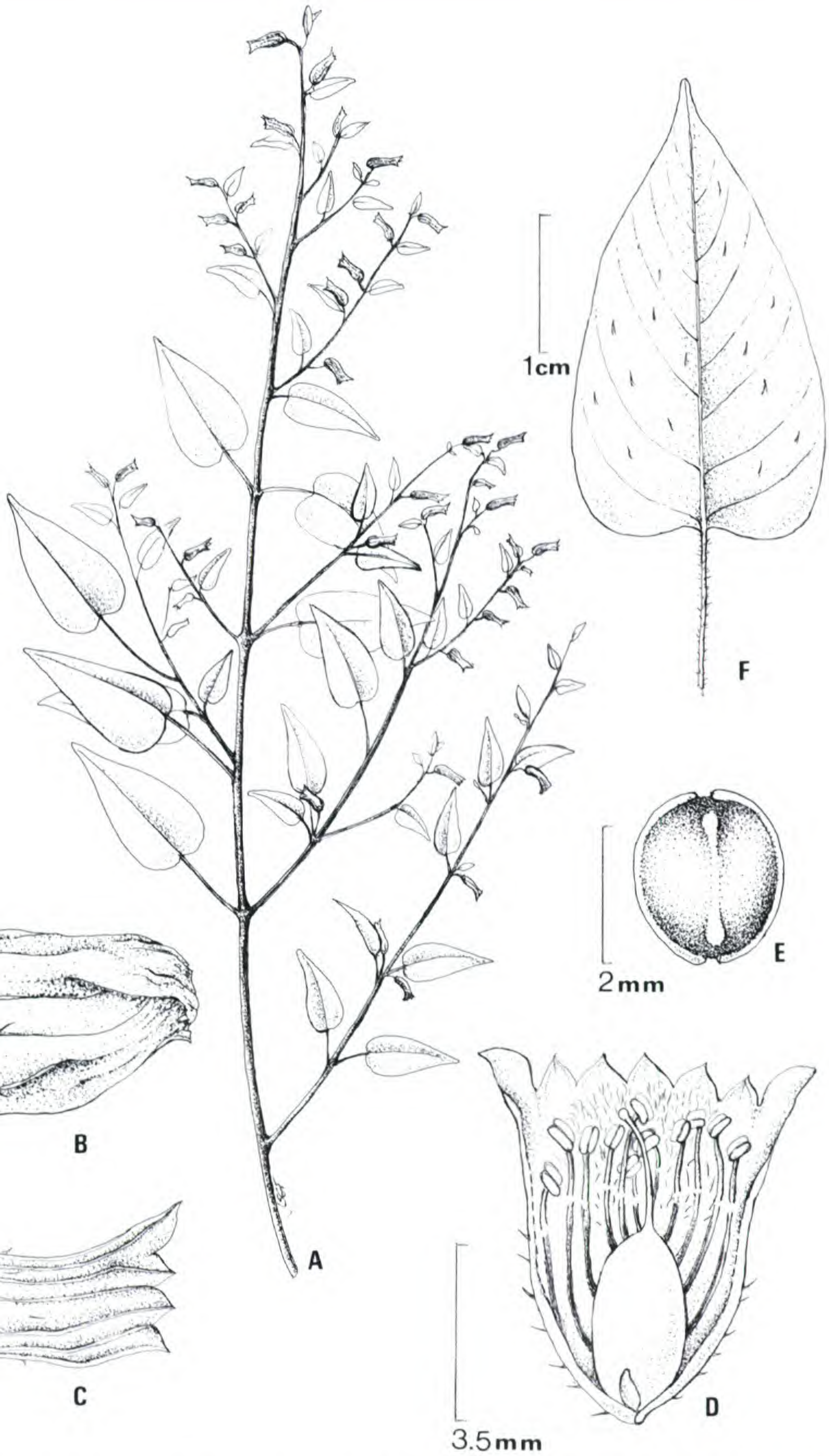

Figure 1. *Cuphea aquilana* S. A. Graham & T. B. Cavalcanti. —A. Habit. —B. Flower in late fruiting stage, lateral view. —C. Flower in early fruiting stage, lateral view. —D. Flower opened dorsally. —E. Seed. —F. Leaf, adaxial surface. (*Soto Núñez 11194*, MO.)

the bracts of the inflorescence; bracts paired, unequal, one strongly reduced or absent. Inflorescences leafy racemes; flowers solitary, interpetiolar, alternate; pedicels 2–5 mm long, filiform, the bracteoles (prophylls) represented by 3 to 5 glandular trichomes. Floral tubes 4–6 × 1.5–1.7 mm, the base rounded or the dorsalmost rib extended 0.2 mm at the base of the tube to form a minute dorsal spur, the neck of the floral tube not contracted at anthesis, the tube greatly distended in fruit becoming ovoid to suborbicular, the mouth tightly closed; outer surface completely green or dorsally flushed red-purple, glabrous or sparsely hispid toward the base, the trichomes 0.2 mm long, pale or reddish;

inner surface neither bialate nor vesiculate, lightly pilose above the stamens, glabrous below; calyx lobes strongly unequal, the dorsal calyx lobe 0.5–0.75 × 2.0 mm, semicircular, white, deflexed in fruit closing the mouth of the tube, the other 5 lobes 0.2–0.3 mm, triangular, white; epicalyx appendages absent or represented by slight thickenings at each sinus between adjacent lobes; petals 0; stamens 11, included, all inserted at ca. ⅔ the length of the tube, glabrous, the 2 dorsalmost stamens shortest, the antesepalous longest; filaments glabrous; anthers not reaching the sinuses of the lobes; pollen oval-triangular in polar view, tricolporate, syncolpate, pores protruding, exine striate on the equator between the poles, the striae extending ca. ½ the distance to the poles, 22.5 μm diam. in lactic acid; style included, glabrous; stigma capitate to punctiform, at the level of the anthers; ovules 2; nectariferous disc 1 mm long, 0.2 mm wide, ligulate, curved over the dorsal side of the ovary. Seeds 2, 2.2–2.4 × 2.0 mm, bilaterally compressed, elliptical to oval in outline, brown, with a narrow, rounded encircling margin, the margin thinned, 0.1 mm wide at the base of the seed flanking the hilum.

Phenology. Flowering and fruiting in September and October.

Distribution and ecology. On slopes of the Sierra Madre, coastal Michoacán, Mexico, just south of the Colima–Michoacán border; in low deciduous woods (selva baja caducifolia); 210 m.

Cuphea aquilana is one of several species with flowers 6 mm long or less that combine the key characters of sections *Brachyandra* Koehne (deeply inserted stamens) and *Heterodon* Koehne (enlarged dorsal calyx lobe; Koehne, 1903). The sections are polyphyletic and their defining characters have evolved multiple times (Graham, 1988, 1998). *Cuphea aquilana* is morphologically most similar to *C. trochilus* S. A. Graham in section *Heterodon* and for the present time is placed in that section. It shares with *C. trochilus* the same vegetative habit, having slender filiform stems and thinly membranous cordate leaves with petioles typically ca. 15 mm long. It differs by the absence of petals and by a rounded floral tube base that contrasts with the prominent conical, horizontal to ascending spur of *C. trochilus*. Seeds are 2 rather than 3 to 6 as in *C. trochilus*, and the nectariferous disc is erect and strap-shaped, rather than triangular and deflexed. Pollen viability of *C. aquilana* is approximately 100% based on a cotton-blue/lactic acid test (Kearns & Inouye, 1993). Position of the anthers and style at the same level deep in the floral tube suggests the species reproduces primarily by self-fertilization.

Paratype. MEXICO. **Michoacán:** Aquila, en El Mirador, a 3 km al W de la desviación a Aquila, carr. Tecomán, Colima–Playa Azul, Mich., 24 Sep. 1983, *E. Martínez S. 4488* (MEXU, MO).

2. Cuphea bahiensis (Lourteig) T. B. Cavalcanti & S. A. Graham, comb. et stat. nov. Basionym: *Cuphea sessilifolia* Martius subsp. *bahiensis* Lourteig, Sellowia 39: 34. 1987. TYPE: Brazil. Bahia: Morro do Chapéu, Morrão, 15 Jan. 1977, *G. Hatschbach 36428* [in the protologue erroneously cited as 306428] (holotype, P not seen; isotype, MBM). Figure 2.

Erect subshrubs, 0.60–1 m tall; branches pubescent, bearing abundant white, short, erect, glandular trichomes, 0.5–1 mm long; internodes typically 2–3 mm long, mostly ca. ½ the length of the subtending leaves. Leaves opposite or rarely 3-verticillate, sessile, crowded and overlapping, 5–13 × 3–9 mm, coriaceous, ovate-lanceolate, base cordate to amplexicaul, apex acute, margin thickened, plane or subrevolute, ciliate with short glandular trichomes; blades bearing sparse glandular trichomes, the midvein and secondary veins prominent on the adaxial surface; leaves abruptly reduced in size toward the stem apex. Inflorescences bracteate racemes, 7–15 cm long, internodes of the inflorescence mostly 10–30 mm long; bracts paired, hypsophylloid, with glandular trichomes; flowers solitary, interpetiolar, alternating at the nodes, sometimes 1 to 3 alternate to nearly opposite on condensed axillary branchlets; pedicels 3.8–4.5 mm long, with the same indumentum as the branches, bibracteolate. Floral tubes 9–11 × ca. 2 mm, including a straight to deflexed, rounded or truncate spur extending 1.5–2.1 mm beyond the pedicel; outer surface wine-red dorsally including the ribs and spur, green ventrally, hirsute, bearing erect, minute non-glandular trichomes and erect, pale glandular trichomes 0.5–0.7 mm long; inner surface not bialate or vesiculate, villose above the stamens, lightly pilose to glabrous below; petals 6, subequal, 4.5–6 × 2.5–4 mm, rose-violet to lilac, caducous; stamens 11, the 2 dorsalmost shortest, included, the others slightly exserted; filaments villous or glabrous; pollen suborbicular in polar view, tricolporate, syncolpate, pores not protuding, colpi bordered by narrow margo, exine psilate under light microscope, 25–27.5 μm diam.; style exserted beyond the anthers at maturity, glabrous, red; stigma punctiform; ovules 3; nectariferous disc broadly attached, deflexed, the apex curled under forming a concavity. Seeds 3, ca. 2 × 2 mm, bilaterally compressed, orbicular in outline, the margin thick, rounded.

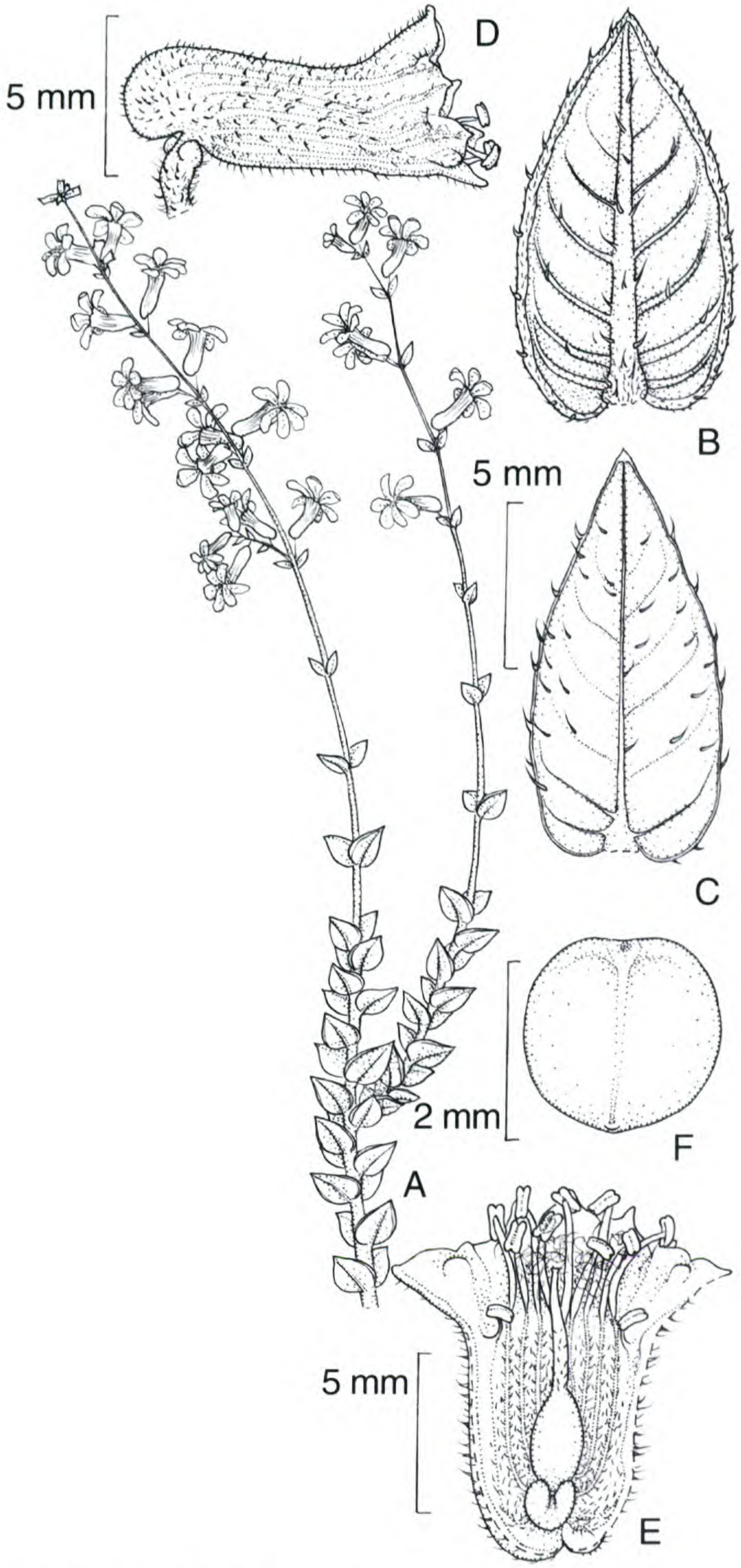

Figure 2. *Cuphea bahiensis* (Lourteig) T. B. Cavalcanti & S. A. Graham. —A. Habit. —B. Leaf, abaxial surface. —C. Leaf, adaxial surface. —D. Flower, lateral view. —E. Flower, opened dorsally, without petals. —F. Seed. (*Cavalcanti et al. 2480*, CEN.)

Phenology. Collected in flower and fruit from September to March.

Distribution and ecology. Known only from Bahia, Brazil, in the vicinity of Morro do Chapéu; forming extensive populations along the roadsides in the municipality; in dry sandy soils, campo rupestre; 870–1190 m.

Cuphea bahiensis is exceptional among the otherwise very similar species of section *Trispermum* for the terminal, highly floriferous inflorescence, which is well-differentiated from the vegetative stem. Other diagnostic features of *C. bahiensis* are the clasping, crowded overlapping leaves on extremely shortened internodes, and the large flowers (9–11 mm long vs. mostly less than 8 mm long in the other rose-flowered species of the section). In the most recent treatment of the section (Lourteig, 1987), *C. inaequalifolia* Koehne and *C. gracilis* HBK are also described with terminal inflorescences, but examination of numerous specimens, including those cited by Lourteig, reveals instead leafy indistinct racemes with flowers partially obscured by the leaves. Although *Cuphea sessilifolia* is vegetatively highly variable, it is unlike *C. bahiensis* except in the commonly held characters that define this taxonomically difficult section, i.e., 3-ovulate ovary, apex of the nectariferous disc curled under to form a concavity, and seeds orbicular with a rounded margin. The full description of *C. bahiensis* expands the original brief diagnosis of the variety.

Selected representative specimens. BRAZIL. **Bahia:** Morro do Chapéu, estrada p/o Morro da Torre de transmissão, ca. 10 km a partir da sede, *Amorim, Carvalho, Silva & Jardim 1049* (MO); Morro do Chapéu–Bonito, km 12, 1 Mar. 1989, *Cavalcanti, Pereira-Silva, Kirkbride Jr. & Roath 357* (CEN, MO); Morro da antena, entrada pela estrada para Wagner, *Cavalcanti, Pereira-Silva, Kirkbride Jr. & Roath 360* (CEN, MO); Morro do Chapéu–Piritiba, km 8, *Cavalcanti, Pereira-Silva, Kirkbride Jr. & Roath 366* (CEN, MO); estrada Utinga–Morro do Chapéu, ca. 10 km de Morro do Chapéu, 12 Jan. 1999, *Cavalcanti, Giulietti, Silva & Harley 2480* (CEN, HUEFS, MO); Telebahia Tower, ca. 6 km S of Morro do Chapéu, *Mori & Boom 14445* (MO, NY); 1–2 km S da cidade, na estrada para Utinga, 16 Nov. 1984, *Noblick 3478* (CEN, HUEFS); estação retransmissora da Telebahia, ca. 6 km W da BA-046, *Queiroz & Nascimento 4282* (HUEFS, NY); Utinga, 4 km de Morro do Chapéu, 25 Sep. 1985, *Wanderley s.n.* (CEN, SP).

3. Cuphea parsonsia var. **grisebachiana** (Koehne) S. A. Graham, comb. et stat. nov. Basionym: *Cuphea grisebachiana* Koehne, in Martius, Fl. Bras. 13: 225. 1877. *Parsonsia grisebachiana* (Koehne) Jennings, Ann. Carnegie Mus. 11: 199. 1917. TYPE: Cuba. Cuba occidental, 1863, *C. Wright 2536(# 332)* (lectotype, designated here, GOET; isotypes, BM, GH, K, MO).

Robust perennial herbs to 40 cm long with semi-woody stems erect to trailing, sparsely branched. Leaves with petioles 1–3 mm long, blades 10–25 × 5–10 mm, ovate-oblong, membranous, somewhat fleshy, glaucous, base rounded, apex acute. Floral tubes 6–7.5 mm long, glabrous; petals 4 mm long; stamens 11. Seeds 6, 2 × 1.75 mm, orbicular-oblong. Chromosome number: $n = 32 + 1–3$ B chromosomes (*Graham 1125*, HAC).

Phenology. Flowering throughout the year.

Distribution. Cuba, in Pinar del Rio, Isla de la Juventud, and western La Habana provinces; wet low places in savannas, disturbed grassy fields, muddy banks; 50–500 m.

Koehne distinguished *Cuphea grisebachiana* by quantitative differences that overlap those of the more widely distributed Antillean *C. parsonsia* (L.) R. Brown. *Cuphea grisebachiana* is judged insufficiently distinct morphologically from *C. parsonsia* to merit the rank of species in *Cuphea* and is here reduced to varietal rank.

KEY TO THE VARIETIES OF *CUPHEA PARSONSIA* IN CUBA

1a. Floral tubes 4–6 mm long, flowers inconspicuous at the nodes; leaves elliptic to ovate, thinly membranous, petioles 0–1 mm long; stamens (1–)5–8(–11) . . . . . var. *parsonsia*

1b. Floral tubes 6–7.5 mm long, flowers conspicuous at the nodes; leaves ovate-oblong, somewhat fleshy, glaucous, petioles 1–3 mm long; stamens 11 . . . . . var. *grisebachiana*

Plants of *Cuphea parsonsia* var. *grisebachiana* are more robust than those of variety *parsonsia* and consistently have larger flowers and the full complement of 11 stamens. Both varieties are self-fertilizing (Graham, 1998, and pers. obs.) and differ in chromosome number. First chromosome counts for the Cuban plants are as follows: *Cuphea parsonsia* var. *parsonsia*: $n = 16$. Cuba: Isla de la Juventud, betw. Nueva Gerona and La Fe, *S. Graham 1122* (HAC); *Cuphea parsonsia* var. *grisebachiana*: $n = 32 + 1–3$ B chromosomes. Cuba: Pinar del Rio, ca. 3 km NE of Pinar del Rio city, swale E of the autopista, *S. Graham 1125* (HAC). The counts suggest that variety *grisebachiana* originated as an autopolyploid of variety *parsonsia* through self-fertilization of unreduced gametes. None of the other species of *Cuphea* sect. *Brachyandra* in Cuba is sufficiently morphologically similar to imply a hybrid origin for variety *grisebachiana*. The range of variety *grisebachiana* is restricted to Cuba and lies within that of variety *parsonsia*, which is distributed throughout the Greater and Lesser Antilles (Graham, 2003).

Selected representative specimens. CUBA. **C. Habana:**

Lomas de la Pite, S. Miguel de Casanova, *Bro. Leon 71631* (NY). **Isla de la Juventud (Isla de Pinos):** near Nueva Gerona, *Curtiss 433* (BM, GH, K, MO, NY, US); savanna near Nueva Gerona, *Roig & Cremata 1754* (NY). **La Habana:** cerca de Artemisa, *Wilson 1729* (HAC, NY). **Pinar del Rio:** Rangel, Sierra del Rosario, *Bro. Alain 192* (GH, NY); vic. of Coloma, *Britton, Britton & Gager 7036* (NY); vic. of Herradura, *Britton & Earle 6567* (NY, US); ca. 3 km NE of Pinar del Rio city on the autopista, *Graham 1125* (HAC, MO); not far from Lagoon Maceriges, S of Los Palacios, *Bro. Leon 7354* (NY); vic. of Los Palacios, *Shafer 11666* (A, NY, US).

4. Cuphea potamophila T. B. Cavalcanti & S. A. Graham, sp. nov. TYPE: Brazil. Goiás: Cavalcante, margem direita do rio Macacão, 13 Dec. 2000, *G. Pereira-Silva & J. B. Pereira 4500* (holotype, CEN; isotypes, MO, SPF). Figure 3.

Fruticulus 80 cm altus, sine ramis, caules pilis malpighiaceis obsitis. Folia subsessilia, elliptica ad oblonga, 30–100 mm longa, 15–35 mm lata. Racemi simplices, frondosi. Flores 19–21 mm longi, virides apice sanguineo, calcari 2–3 mm longo, descendenti; lobus dorsalis haud productus; appendices lobis breviores; petala 6, subaequalia, 4–5 mm longa, sanguinea; ovula 6; discus nectarifer horizontalis, crassus.

Perennial subshrubs to 80 cm, stems erect, several from a woody rootstock, unbranched, reddish brown bark exfoliating in narrow thin strips at the base, distally bearing dense soft curled pubescence and abundant malpighiaceous, unequally bi-armed trichomes, the basal-directed arm shortest; internodes ½ the length of the subtending leaves. Leaves opposite, petioles 2 mm long; blades 30–100 × 15–35 mm, thickly membranous, elliptical to lanceolate or oblong, spreading, base attenuate, apex acute or short-acuminate, margin plane; blade surfaces scabrous, the trichomes minute, appressed, the upper surface also with scattered minute bi-armed trichomes; leaves gradually reduced in size toward the stem apex. Inflorescences terminal leafy racemes, 6–10 cm long, sparsely flowered, interpetiolar flowers solitary, alternate, 1 to 3 additional flowers on axillary branchlets; pedicels 6–10 mm long, bibracteolate; bracteoles ovate, ca. 1 mm long. Floral tubes 19–21 × 4–5 mm, including a descending spur 2–3 mm long, the floral tube dorsally straight, the neck not contracted in fruit, the mouth blunt to slightly oblique by extension of the ventral side; outer surface green, becoming red distally and ventrally from the level of anther insertion to the margin of the tube, bearing minute bi-armed trichomes, the ribs with conspicuous red-purple setae to 2 mm long; inner surface lightly pilose above the stamens and on the vein below each short dorsal stamen; calyx lobes equal, 1 × 1.5 mm, broadly triangular; appendages ca. ½ as long as the calyx lobes, green, thick, the margin free, bearing 1 to 3 red-purple setae to 3 mm long; petals 6, subequal, 4–5 × 2–4 mm, clear bright red, oblong to slightly obovoid; stamens 11, the 2 dorsalmost shortest, inserted below the ventral 9, 5 antesepalous stamens exserted, the others reaching the margin of the tube; filaments lightly villous; pollen oval-triangular in outline, tricolporate, syncolpate, the exine striate between the poles, 25 μm diam.; style long-exserted, glabrous; stigma capitate to punctiform; ovary non-gibbous, glabrous; ovules 6; nectariferous disc 1.5 mm long, 2.5 mm wide, thick, rounded on the margin, in the same plane as the ovary. Seeds 3 × 2.7 mm, bilaterally compressed, suborbicular, dark greenish brown, the rounded margin paler in color.

Phenology. Known to flower and fruit in December and February.

Distribution and ecology. Brazil, in west-central Goiás; rare in an inundated area at the margin of rio Macacão in a gallery forest, and in a nearby humid field on the slope of the serra; 300–380 m.

Cuphea potamophila (Gr., "river-loving") is most similar to *C. grandiflora* Koehne in section *Melvilla* subsect. *Pachycalyx*, differing principally by the green floral tube with red apex and red-purple setae. In *C. grandiflora*, the floral tube is red with a yellow apex and the indumentum is strigose or hirsute. The petals of *C. potamophila* are larger than those of *C. grandiflora* (4–5 mm long vs. 1.5–2.5 mm long) and clear bright red rather than deep wine-black. Vegetatively the species are very similar and both grow in riverine habitats in Goiás.

Paratypes. BRAZIL. **Goiás:** Cavalcante, estrada Vila Veneno–Serra Branca, km 3.6 (margem direita do rio Macacão), 20 Feb. 2000, *G. Pereira-Silva, J. B. Pereira, J. A. Jesus, M. C. Silva & S. dos Santos 5900* (CEN); Cavalcante, margem direita do rio Macacão, 29 Nov. 2001, *G. Pereira-Silva, J. B. Pereira, J. A. Jesus & J. F. B. Pastore 5765* (CEN, MO).

5. Cuphea pulchra Moricand var. **corollata** T. B. Cavalcanti & S. A. Graham, var. nov. TYPE: Brazil. Bahia: Piatã, estrada Piatã–Boninal, Tiguco, 1180 m, 12 Nov. 1996, *H. P. Bautista & N. Hind (PCD) 4226* (holotype, HUEFS; isotypes, ALCB, CEN [4], SPF). Figure 4.

A varietate typica 6 petalis conspicuis, sanguineis differt.

Shrubs 1–1.2 m tall, much branched distally, branches bearing abundant, short glandular trichomes; internodes 5–20 mm long. Leaves opposite, sessile, blades 10–23 × 5–18 mm, oval-lanceolate to ovate, chartaceous, base subcordate to

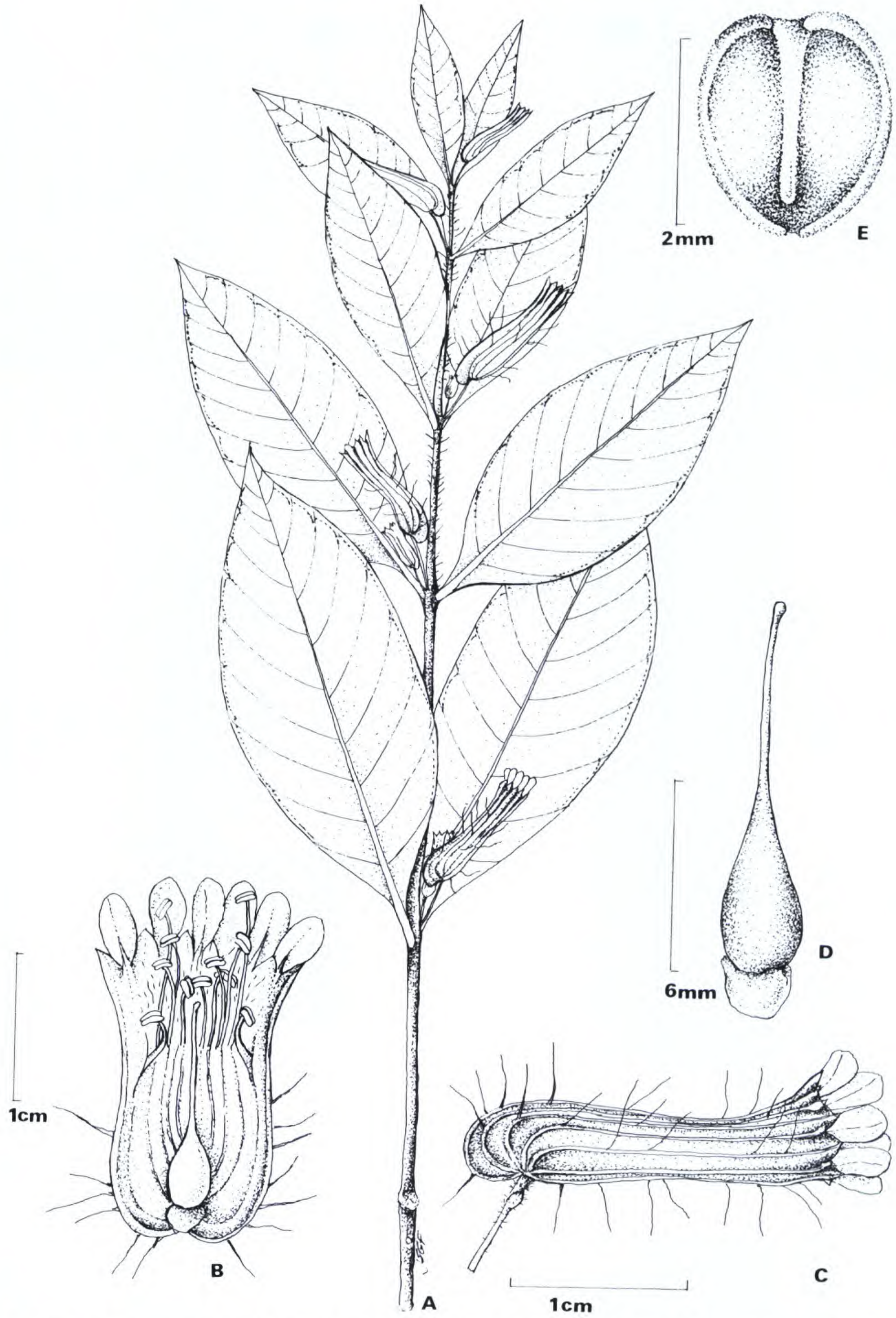

Figure 3. *Cuphea potamophila* T. B. Cavalcanti & S. A. Graham. —A. Habit. —B. Flower, opened dorsally. —C. Flower, lateral view. —D. Ovary with basal nectariferous disc (*Pereira-Silva & Pereira 4500*, CEN). —E. Seed (*Pereira-Silva et al. 5900*, CEN).

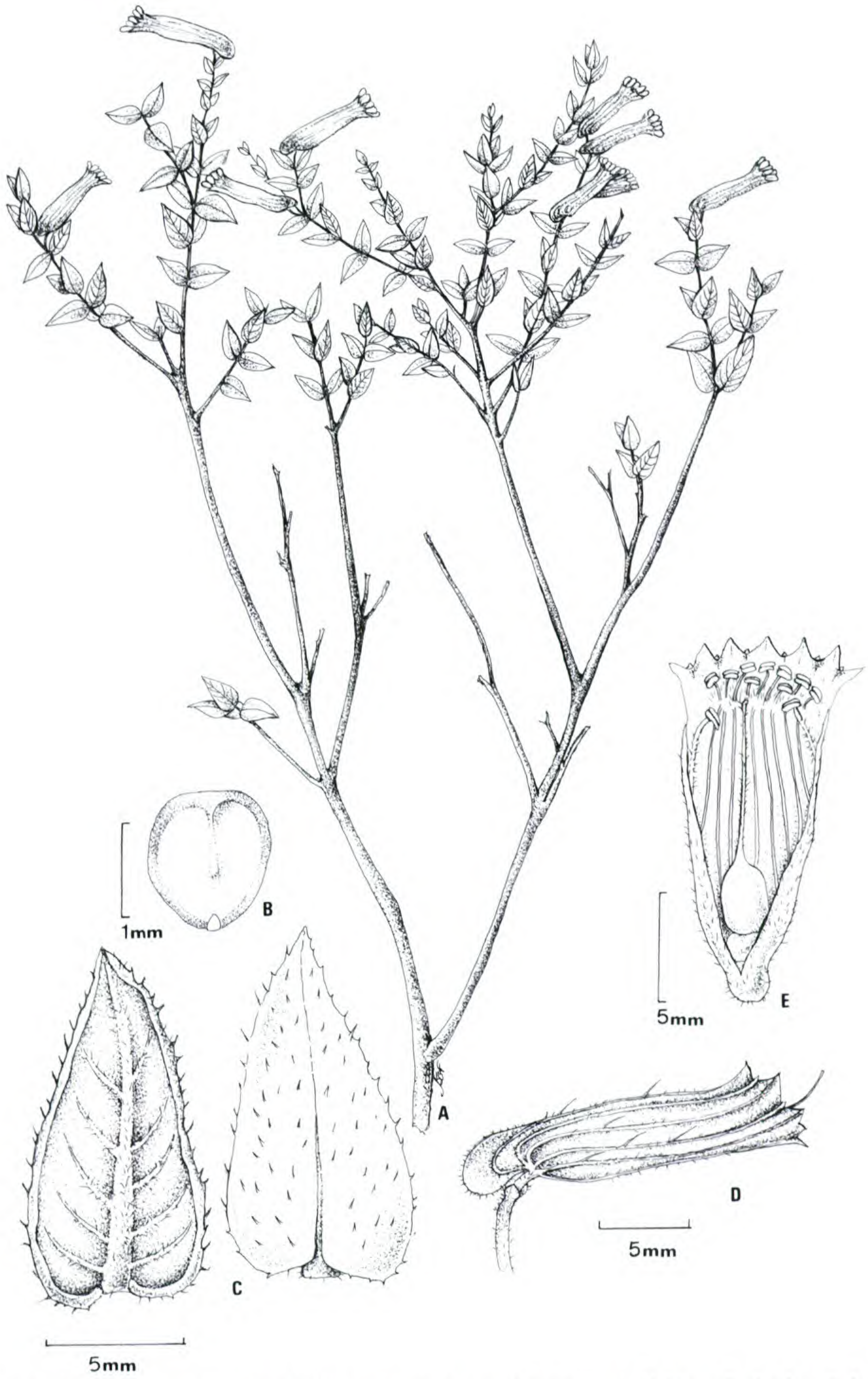

Figure 4. *Cuphea pulchra* var. *corollata* T. B. Cavalcanti & S. A. Graham. —A. Habit. —B. Seed. —C. Leaf, abaxial surface on left, adaxial surface on right. —D. Flower, lateral view. —E. Flower, opened dorsally, without petals. (*Bautista & Hind 4226*, CEN.)

cordate, apex obtuse to acute or sometimes acuminate, margin subrevolute, short ciliate with sparse glandular trichomes; blade surfaces scabrous, non-glandular trichomes minute and appressed, glandular trichomes short, sparse; leaves gradually reduced in size toward the stem apex. Inflorescences terminal leafy racemes of 2 or 3 flowers; pedicels 9–12 mm long, bibracteolate; bracteoles broadly ovate, 1–1.2 mm long. Floral tubes 12–20 × 4–5 mm, including a descending spur 4–4.5 mm long, the tube dorsally straight; outer surface red-orange with dark red veins, becoming yellow-red apically and ventrally, pubescent; inner surface glabrous or lightly pubescent especially around the base of the ovary, pilose above the stamens; calyx lobes equal, 0.5 mm long; epicalyx appendages 0.5–0.7 mm long, green, bearing minute glandular trichomes; petals 6, subequal, 3–3.5 mm long, 1.5–2.5 mm wide, deep red, oblong to obovoid; stamens 11, 5 antesepalous exserted, the others reaching the margin of the tube; style lightly pilose; stigma punctiform; ovary glabrous; ovules 3 to 6; nectariferous disc 1.5 mm long, ca. 2 mm wide, thick, semi-circular in dorsal view. Seeds not seen.

Phenology. Flowers collected in November and April, immature fruits present in April.

Distribution and ecology. Brazil, in central Bahia, in campo rupestres and along margins of cerrado woodlands within the range of *Cuphea pulchra* Moricand var. *pulchra*; 1180 m.

KEY TO THE VARIETIES OF *CUPHEA PULCHRA* IN BAHIA, BRAZIL

1a. Petals 0; floral tubes pilose to villose within; inflorescences terminal racemes typically with ca. 8 to 17 flowers . . . . . var. *pulchra*
1b. Petals 6, deep red; floral tubes glabrous to pilose within; inflorescences limited to 2 or 3 terminal flowers . . . . . var. *corollata*

The presence of six deep red petals in *Cuphea pulchra* var. *corollata* easily separates it from apetalous *C. pulchra* var. *pulchra* Moricand. Plasticity of petal presence and reduction in petal number or size within a species is found in other species of *Cuphea* and in other genera of the Lythraceae, as for example in *Cuphea paucipetala* S. A. Graham (Graham, 1988) and *Ammannia latifolia* L. (Graham, 1985). Given that the flowers of variety *corollata* are otherwise very similar or identical to the non-petaled ones of variety *pulchra* and occur on plants within the larger range of variety *pulchra*, we choose to recognize this distinction at the varietal level.

Paratype. BRAZIL. **Bahia:** Jacobina, Serra da Jaqueira, na subida da Fazenda do Japonês, 2 Apr. 1999, *R. M. Harley & A. M. Giulietti 53695* (CEN, HUEFS).

6. Diplusodon virgatus var. **occidentalis** T. B. Cavalcanti & S. A. Graham, var. nov. TYPE: Bolivia. Santa Cruz: Velasco, Par. Nac. Noel Kempff Mercado, Camp. Huanchaca I, cerrado, 650 m, 17 May 1994, *L. Arroyo, B. Mostacedo, H. Gonzales, S. Cabrera & J. Surubi 684* (holotype, MO; isotype, USZ not seen).

Differt haec varietas a habitu robusto fruticulo foliis sessilis basi cuneatis, floribus carnosioribus globosioribus.

Robust shrubs 0.7–2 m tall. Leaves sessile, 20–48 × 7–13 mm, subcoriaceous, ovate-lanceolate, the base cuneate, the apex obtuse to retuse, venation eucamptodromous. Inflorescences leafy, racemose, the accessory branches ascending; pedicels 2 mm long; bracteoles 5–6 × 2–3 mm, elliptic-lanceolate, reaching the sinuses of the calyx lobes or slightly below. Floral tubes 5–6 mm long from base to the sinuses of the calyx lobes, 4.5–5.5 mm wide, subglobose in fruit; calyx lobes 1.6–2 mm long, 1–1.3 mm wide; epicalyx segments 2.5–3 × 0.5–1 mm, exceeding the calyx lobes, linear-oblong, thick, partially deflexed in fruit; stamens 12; style 10 mm long; ovary glabrous; ovules 38.

Phenology. Flowering and fruiting in May, fruiting in June.

Distribution and ecology. Eastern Bolivia, western Mato Grosso, and Mato Grosso do Sul, Brazil, in woody savanna [cerrado]; 500–650 m.

KEY TO THE VARIETIES OF *DIPLUSODON VIRGATUS* IN BRAZIL AND BOLIVIA

1a. Leaves petiolate, long-attenuate; branches of the inflorescence diverging from the main stem . . . . . var. *virgatus*
1b. Leaves sessile, cuneate at the base; branches of the inflorescence ascending . . . . . var. *occidentalis*

Among the 60 or more species of *Diplusodon*, *D. virgatus* Pohl is unique in having white-petaled flowers and a small tree habit (4 m). The rest of the genus consists of subshrubs and shrubs (mostly 0.5–2.0 m) with rose to purple flowers. This new variety is also white-petaled but is a robust shrub with more coriaceous leaves and thicker epicalyx segments on the flowers than in variety *virgatus*. Of greatest diagnostic value are the sessile, narrowly cuneate leaves and short ascending branches of the inflorescence, which form a narrow angle with the stem. *Diplusodon virgatus* var. *virgatus* has slender, long-attenuate, petiolate leaves; the branches of the inflorescence typically form a wide angle with the stem.

An intermediate collection (BRAZIL. **Mato Grosso:** ca. 9 km NE of Barra do Garças, 6 Mai. 1973, *W. R. Anderson 9795* [MO, NY, UB]), with subcoriaceous, sessile leaves and widely divergent inflorescence branches, is known from easternmost Mato Grosso near the border with Goiás in a geographically intermediate position between variety *occidentalis* and the widespread eastern Brazilian variety *virgatus*. *Diplusodon virgatus* var. *occidentalis* is the second *Diplusodon* to be discovered in Bolivia. *Diplusodon bolivianus* T. B. Cavalcanti & S. A. Graham is also from cerrado in Noel Kempff M. National Park, in an area south of the *D. virgatus* var. *occidentalis* locality (Cavalcanti & Graham, 1996). It is easily separated from *D. virgatus* var. *occidentalis* by the rose-petaled flowers, distinctly terminal inflorescences, and by the hirsute to sericeous yellowish indument that covers all parts of the plant.

Paratypes. BRAZIL. **Mato Grosso:** Juruena, Apr. 1909, *F. C. Hoehne 1796, 1798* (R), May 1909, *F. C. Hoehne 1846* (R); Nova Ubiratã, estr. rio Teles Pires, 1 May 1997, *A. G. Nave 1415* (CEN); Diamantino, Faz. Pequeno Figueiredo, cerca de 4 km em linha reta de Diamantino, 22 May 1997, *V. C. Souza, A. R.. Duarte, J. P. Souza & V. R. Scalon 16844* (CEN, ESA); Tapurah, estr. Capixaba, ca. 20 km de Tapurah, 12 June 1997, *V. C. Souza, A. R. Duarte, J. P. Souza & Miyagi 17830* (CEN, ESA). **Mato Grosso do Sul:** Selúria, Faz. de Ensino e Pesquisa da UNESP, Campus Ilha Solteira, 22 Apr. 1991, *J. Santos 370* (UB), 5 Apr. 1991, *O. Tiritan 584* (UB), May 1991, *J. Santos 413* (UB).

Taxonomic Notes

Cuphea xanthopetala S. A. Graham & T. B. Cavalcanti was described from a single collection from Mato Grosso, Brazil (Graham & Cavalcanti, 1999). The following collection extends the range of the species to the state of Amazonas and confirms it as a species of white sand habitats. BRAZIL. **Amazonas:** rodovia do Estanho, margem da rodovia a 150 km de Humaita, campina, solo arenoso branco, 25 Sep. 1979, *G. Vieira, J. Zarucchi, A. Silva, C. Mota & O. Monteiro 148* (INPA, MO, NY).

Diplusodon bolivianus T. B. Cavalcanti & S. A. Graham, previously known only from the type collection, is further represented by the following. BOLIVIA. **Santa Cruz:** Velasco Prov., Par. Nac. Noel Kempff Mercado colecta general de Huanchaca 1, en la pampa cerca de la pista de Huanchaca, *A. Soto, Pamfil, Moore & Soliz 365* (MO); colectado a 2 km de la pista, *Soto, Pamfil, Moore & Soliz 427, 463* (MO). BRAZIL. **Mato Grosso:** BR 364, Vilhena-Comodoro, 84 km S de Vilhena, 25 June 1997, *Cavalcanti, Pereira-Silva, Baltazar & Graham 2381* (CEN, NY); Tapurah, estr. Capixaba, ca. 20 km NE de Tapurah, 10 June 1997, *Souza, Duarte, Souza & Miyagi 17617* (CEN, ESA), 12 June 1997, *Souza, Duarte, Souza & Miyagi 17863* (CEN, ESA).

Acknowledgments. We thank the curators of MEXU, NY, and HUEFS for the opportunity to study their collections; Rogério da Costa Vieira, Aécio Amaral dos Santos, and José Geraldo Alves Vieira (CEN) for specimen and data transfer to MO; and an anonymous reviewer for helpful comments. The support of Embrapa and CNPq made possible field and herbarium studies by T. B. Cavalcanti and S. Graham with the assistance of Glocimar Pereira-Silva. The National Science Foundation is gratefully acknowledged for partial support to S. Graham of this research (DEB-9509524). The illustrations were drawn and inked by Jeanitto Sebastião Gentilini and Taciana Cavalcanti.

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Notes on Grasses (Poaceae) for the *Flora of China*, III: A New Name in *Festuca*

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ABSTRACT. The new name *Festuca sinomutica* X. Chen & S. M. Phillips (Poaceae) is proposed for a species of *Festuca* from Yunnan Province, China.

Key words: China, *Festuca*, Poaceae, subgenus *Drymanthele*.

During the course of revisionary work on *Festuca* L. for the *Flora of China* Poaceae account, it was found that a new name is required for *Festuca mutica* S. L. Lu, which is a later homonym of *F. mutica* Chevall. Lu Sheng-Lian was the author of the account of *Festuca* in the Chinese-language *Flora* (2002), used as the basis for the English-language *Flora of China*, now in preparation.

Festuca sinomutica X. Chen & S. M. Phillips, nom. nov. Replaced name: *Festuca mutica* S. L. Lu, Acta Phytotax. Sin. 30(6): 534, f. 3. 1992, non *F. mutica* F. F. Chevallier, Fl. Gén. Env. Paris ed. 1: 167. 1827, nec *F. mutica* F. X. Wulfen, Fl. Norica Phan.: 145. 1858. TYPE: China. Yunnan: Eryuan, in the vicinity of Nandaping Heishanmen, 2900 m, in meadows, 31 July 1963, *Jinshajiang Expedition 63-6359* (holotype, PE not seen; isotype, NJU not seen).

Festuca is a large genus in China, with 58 species recorded as present in the *Flora of China* account, almost half of them endemic and many of these based on single specimens. This species, *F. sinomutica*, appears to be known only from the type, which has not been seen. However, a full description and detailed illustration are provided in the protologue.

Festuca sinomutica is a member of subgenus *Drymanthele* V. Kreczetowicz & Bobrov, which comprises relatively robust species with the following characteristics: large loose panicles, flat leaf blades, coriaceous scales at the base of the shoots, leaf sclerenchyma as individual bands opposite the vascular bundles, awnless lemmas keeled only above the middle, and a pubescent ovary apex.

S. L. Lu (1992) placed this species (as *Festuca mutica*) in subgenus *Drymanthele* and made it the type species of the new section *Muticae* S. L. Lu, including also *Festuca changduensis* L. Liou, *F. dolichantha* P. C. Keng, and *F. modesta* Steudel. *Festuca modesta* occurs in northwestern India and Nepal as well as China, but the others in section *Muticae* are Chinese endemics. *Festuca changduensis* and *F. dolichantha* are anomalous in subgenus *Drymanthele* as they have a glabrous ovary. It is clear that much more work is needed on *Festuca* in China when more material is available.

A key is provided below to separate the four species of section *Muticae*. All are over 60 cm tall, usually with flat leaf blades and with awnless lemmas.

KEY TO SPECIES OF *FESTUCA* SECT. *MUTICAE* IN CHINA

1a. Panicle 7–9 cm; florets 9 to 10 . . . . *F. sinomutica*
1b. Panicle more than 15 cm; florets 3 to 5.
  2a. Spikelets 6–7 mm; first lemma ca. 5 mm; anthers 1.5–2 mm . . . . . *F. changduensis*
  2b. Spikelets 7–15 mm; first lemma 7–11 mm; anthers 2.5–4 mm.
    3a. Leaf sheaths smooth or scabrid; anthers 3–4 mm; ovary apex glabrous . . . . . *F. dolichantha*
    3b. Leaf sheaths with retrorse hairs at base; anthers 2.5–3.2 mm; ovary apex pubescent . . . . . *F. modesta*

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Novae Gesneriaceae Neotropicarum XIV: Four New Species of *Alloplectus* from South America

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ABSTRACT. A monographic revision of *Alloplectus* (Gesneriaceae) has revealed four species new to science from Colombia, Ecuador, and Peru. These species are described here and include *A. carpishensis* from Peru, *A. inflatus* from Colombia, *A. serpens* from Colombia and Ecuador, and *A. oblongicalyx* from Colombia and Ecuador.

Key words: *Alloplectus*, Colombia, Ecuador, Gesneriaceae, Peru.

The most recent treatment of the genus *Alloplectus* Martius is that of Hanstein (1865). Hanstein's publication focused on the Gesneriaceae at the botanical garden in Berlin to provide an overview of the family, and *Alloplectus* was only a part of a monograph of the known Gesneriaceae. Hanstein recognized 30 *Alloplectus* species in his treatment. Recent estimates of the genus range from 65 (Wiehler, 1973) to 75 species (Burtt & Wiehler, 1995). From a thorough review of the 119 names listed in *Index Kewensis*, only 32 are considered by us to be currently accepted names in *Alloplectus*.

Preliminary phylogenetic analyses based on the nuclear ribosomal internal transcribed spacer region (ITS) have shown that *Alloplectus* is polyphyletic (Clark & Zimmer, 2003). A more restricted monophyletic group containing the type species for the genus, *Alloplectus hispidus* (Kunth) Martius, includes the new *Alloplectus* species presented here. This more restricted definition of *Alloplectus* is characterized by the presence of resupinate flowers, a unique synapomorphy for the clade. The species described here were frequently collected and represented in numerous herbaria, but were annotated as belonging to other species of *Alloplectus*. The four new species below are derived from a monographic study of *Alloplectus* and allied genera, a review of herbarium collections (4000+ collections from 30+ herbaria), and five years of fieldwork by the first author in Ecuador with recent forays of fieldwork in Peru and herbarium work in Colombia.

Alloplectus carpishensis J. L. Clark & I. Salinas, sp. nov. TYPE: Peru. Huánuco: Chinchao, San Pedro de Carpish, above Carpish tunnel, ca. 47 km N of Huánuco on the road to Tingo María, 09°43′14″S, 76°06′53″W, 2770–2900 m, 1 Nov. 2001, *I. Salinas 224* (holotype, USM; isotype, US). Figure 1.

Ad *A. serpentem* similis sed in foliis ellipticis dense pubescentibus, lobis calycis apice acuminatis et corollis uniformiter flavis differt.

Subshrubs; terrestrial, stems erect to horizontal (on steep slopes), rarely branched, to 2 m tall, subwoody, subquadrangular to terete, glabrescent below, densely villous above. *Leaves* opposite, equal in a pair; petioles terete, 1–4 cm long, green, densely villous; blades subcoriaceous when dry, elliptic to slightly falcate, 8–19 × 2–5 cm, base acute to oblique, apex acute, margin serrate, adaxially green, uniformly sericeous, abaxially pale green, densely sericeous (especially on veins). *Inflorescence* epedunculate, reduced cyme, appearing fasciculate, with 1 to 7 flowers per node; bracteoles ovate, 2–3 × 1–2 cm; pedicels shorter or longer

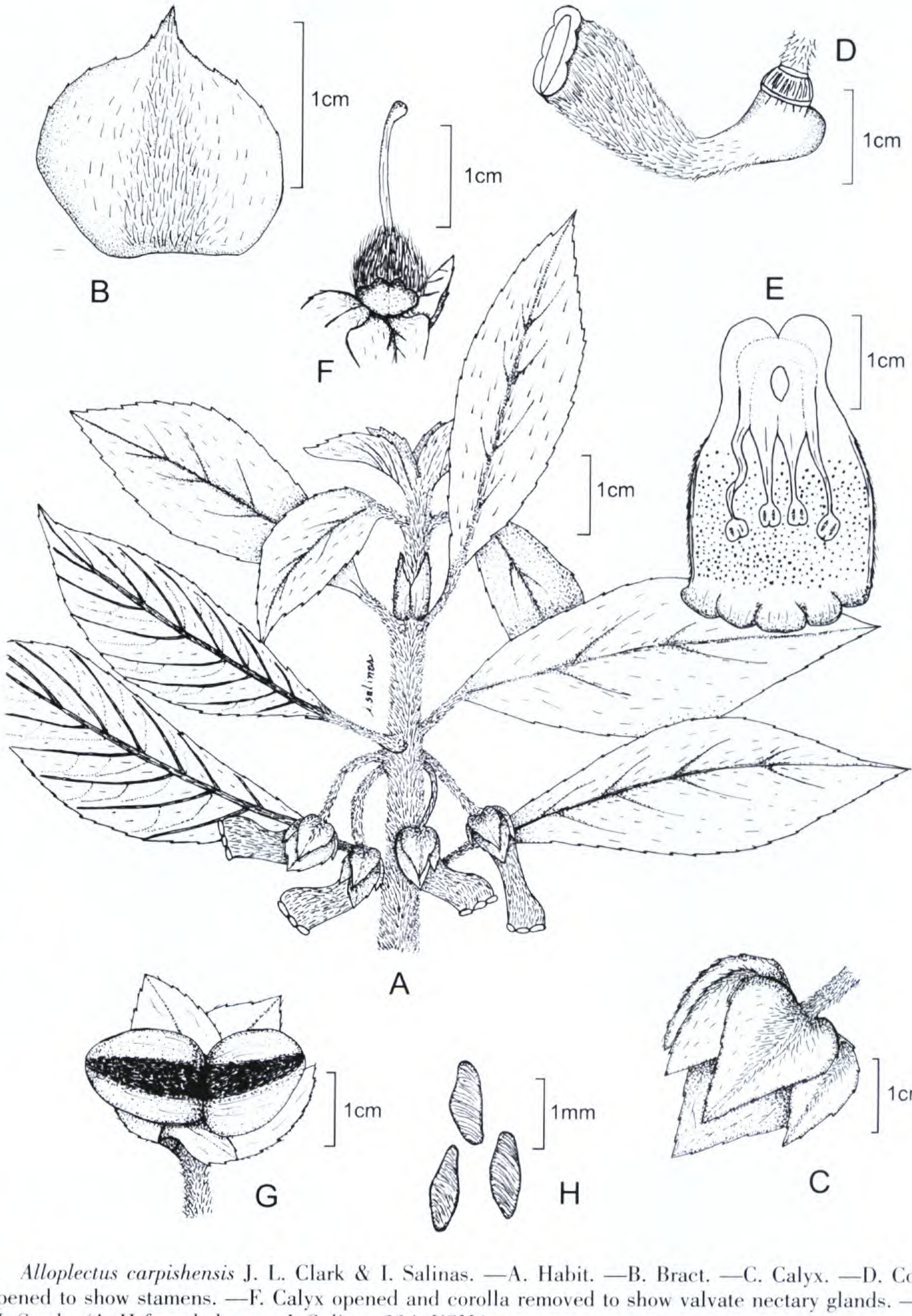

Figure 1. *Alloplectus carpishensis* J. L. Clark & I. Salinas. —A. Habit. —B. Bract. —C. Calyx. —D. Corolla. —E. Corolla opened to show stamens. —F. Calyx opened and corolla removed to show valvate nectary glands. —G. Mature fruit. —H. Seeds. (A–H from holotype, *I. Salinas 224*, USM.)

than the petiole, 1–4 cm long, densely villous. *Flowers* zygomorphic, resupinate; calyx lobes 5, nearly free, each appressed to adjacent lobe, folded lengthwise with the margin curved inward, erect, subequal, ovate, 10–17 × 6–12 mm, base cordate, apex acute, margin serrate, bright red, outside sparsely to densely pilose, inside sparsely pilose, persistent in fruit; corolla horizontal in calyx, to 4 cm long, tubular, tube 3.5 cm long, gibbous posteriorly on lower surface, spur absent; base 6–8 mm diam., middle ampliate, becoming apically ventricose on upper surface, throat constricted, appearing laterally compressed, to 1 cm wide (at mouth), outside yellow, densely pilose, inside mostly yellow with red spots and small glandular trichomes, limb reflexed, to 1 cm wide, lobes subequal, rotund, to 3 mm long, to 3 mm wide, rounded, entire; nectary deeply bilobed to separate valvate glands, on ven-

tral surface of ovary, glabrous; stamens 4, didynamous, included; filaments coiling after anthesis, 1.9 cm long, connate at base, adnate to base of corolla tube for 6–8 mm, glabrous; anthers broader than long, ca. 2 mm long, ca. 3 mm wide, dehiscing by longitudinal slits; staminode present; ovary ovoid, 3–6 × 3–5 mm, densely pilose, style 1–2.5 cm long, glabrous, stigma stomatomorphic. *Fruit* a fleshy capsule, pendent when ripe, ovoid, bivalved, 1.5 × 1.5 cm, pilose; seeds numerous, fusiform, 1–1.4 × 0.3 mm, longitudinally striate, dark brown.

Phenology. Flowering from December to May and August to November; fruiting from June through November.

Distribution (Fig. 5). *Alloplectus carpishensis* is known from the eastern Andean slopes of Peru from 2200 to 3000 m. Sixteen collections have been made from Carpish in the department of Huánuco. Two other collections are known from the departments of Cuzco and San Martín. No collections of *A. carpishensis* have been made outside of Peru, thus making this species geographically distinct from the similar *A. serpens* of Ecuador and southern Colombia.

Alloplectus carpishensis is distinguished from the similar *A. serpens* and other species of *Alloplectus* by the densely pubescent, elliptic leaves, and uniformly bright yellow corollas. Additional characters that help differentiate *A. carpishensis* are the ovate calyx lobes and acute apices instead of the more oblong calyx lobes with rounded apices found in *A. serpens*. The nectary in this new species is unique because it ranges from a single bilobed gland to two separate valvate glands instead of the more common single bilobed gland in most other *Alloplectus* species. Specimens of *A. carpishensis* were annotated in herbaria as *A. ichthyoderma* Hanstein. The stems of *A. carpishensis* lack the scales that are typical for *A. ichthyoderma* and have uniformly bright yellow flowers, in contrast to the yellow flowers with a dorsal red stripe in *A. ichthyoderma*.

Paratypes. PERU. **Cuzco:** La Convención, *T. R. Dudley 10845* (NA, US). **Huánuco:** above Acomayo, *P. C. Hutchison, J. K. Wright & R. M. Straw 5958* (US, USM); Distrito Chinchao, Cerro Carpish, near Carpish tunnel, 45–50 km N of Huánuco on the road to Tingo María, *R. Ferreyra 1229* (US, USM), *R. Ferreyra 6848* (US[2], USM), *C. Davidson & J. Jones 9196* (LAM, US), *B. A. Stein & C. Todzia 2293* (US, USM), *H. A. Allard 21085* (BH, US), *J. L. Clark, I. Salinas & H. Beltran 8247* (US, USM), *A. H. Gentry 44883* (US), *R. Ferreyra 2330* (MO, US[2], USM), *L. E. Skog, J. E. Skog, G. Lamas M. & J. Schunke V. 5140* (MO, US, USM), *J. L. Clark, I. Salinas & H. Beltran 8249* (US, USM), *J. Schunke V. 5225* (F, US), *C. Sandeman 5172* (K); El Mirador, 15 km from Chinchao, *J. Schunke V. 5246* (F, US); trail from San Pedro de Carpish, 3 km E of tunnel, *B. A. Stein, J. Kallunki & C. Diaz 3851* (US, USM). **San Martín:** Mariscal Caceres, P. N. Río Abiseo, near Gran Pajaten ruins, *K. Young 1260* (F).

Alloplectus inflatus J. L. Clark & L. E. Skog, sp. nov. TYPE: Colombia. Cundinamarca: Muchindote Valley, E side of Quebrada Negra, 13 km NE of Gachetá, 2800 m, 4 July 1944, *M. L. Grant 9596* (holotype, COL; isotypes, MO, NA[2], NY, US, WIS). Figure 2.

Ad *A. hispidum* similis sed pauce ramosus, in lobis calycis valvatis margine base appressis et in corollis atrosanguineis differt.

Shrubs; terrestrial or epiphytic, stems scandent, sparingly branched; to 2 m tall, woody, terete, densely hirsute. *Leaves* opposite, usually equal in a pair; petioles 0.5–2 cm long, densely hirsute; blades coriaceous when dry, broadly elliptic, 3–10 × 1–5 cm, base somewhat rounded to acute, apex obtuse to acute, margin serrate, adaxially dark green, tomentose, abaxially light green to red, sparsely to densely hispid especially on the veins. *Flowers* solitary; bracteoles absent; pedicels longer than the petiole, 2–7 cm long, pilose. *Flowers* subregular, not resupinate; calyx lobes 5, nearly free, basally appressed to adjacent lobe, erect, subequal, broadly ovate, 15–20 × 5–10 mm, base truncate, apex attenuate, margin laciniate-serrate, red, outside densely pilose, inside sparsely pilose; corolla oblique in calyx, 4.0–5.5 cm long, tubular, tube ca. 4.0 cm long, gibbous posteriorly on lower surface, spur absent; base ca. 1 cm diam., middle ampliate, becoming ventricose on upper surface, throat constricted, not appearing laterally compressed, ca. 1 cm wide at mouth, uniformly red, outside densely pilose, inside glabrous, limb oblique, ca. 1 cm wide, lobes nearly equal, rotund, spreading, 2 × 3.5 mm, rounded, entire; nectary gland bilobed, on ventral surface of ovary, glabrous; stamens 4, didynamous, included; filaments coiling after anthesis, ca. 1.5 cm long, basally connate, adnate to base of corolla tube for ca. 2 mm, glabrous; anthers broader than long, 1 mm long, 2 mm wide, dehiscing by longitudinal slits; staminode absent; ovary ovoid, ca. 7 × 4 mm, densely pilose, style 1.4 cm long, glabrous, stigma shallowly bilobed. *Fruit* a fleshy capsule, pendent when ripe, ovoid, bivalved, 1.5 × 1.5 cm, pilose; seeds numerous, fusiform, ca. 1.3 × 0.4 mm, longitudinally striate, dark brown.

Phenology. Flowering from February through December; fruiting from August through November.

Distribution (Fig. 5). *Alloplectus inflatus* is known from the Andes of Colombia. It has been collected from departments in the Cordillera Cen-

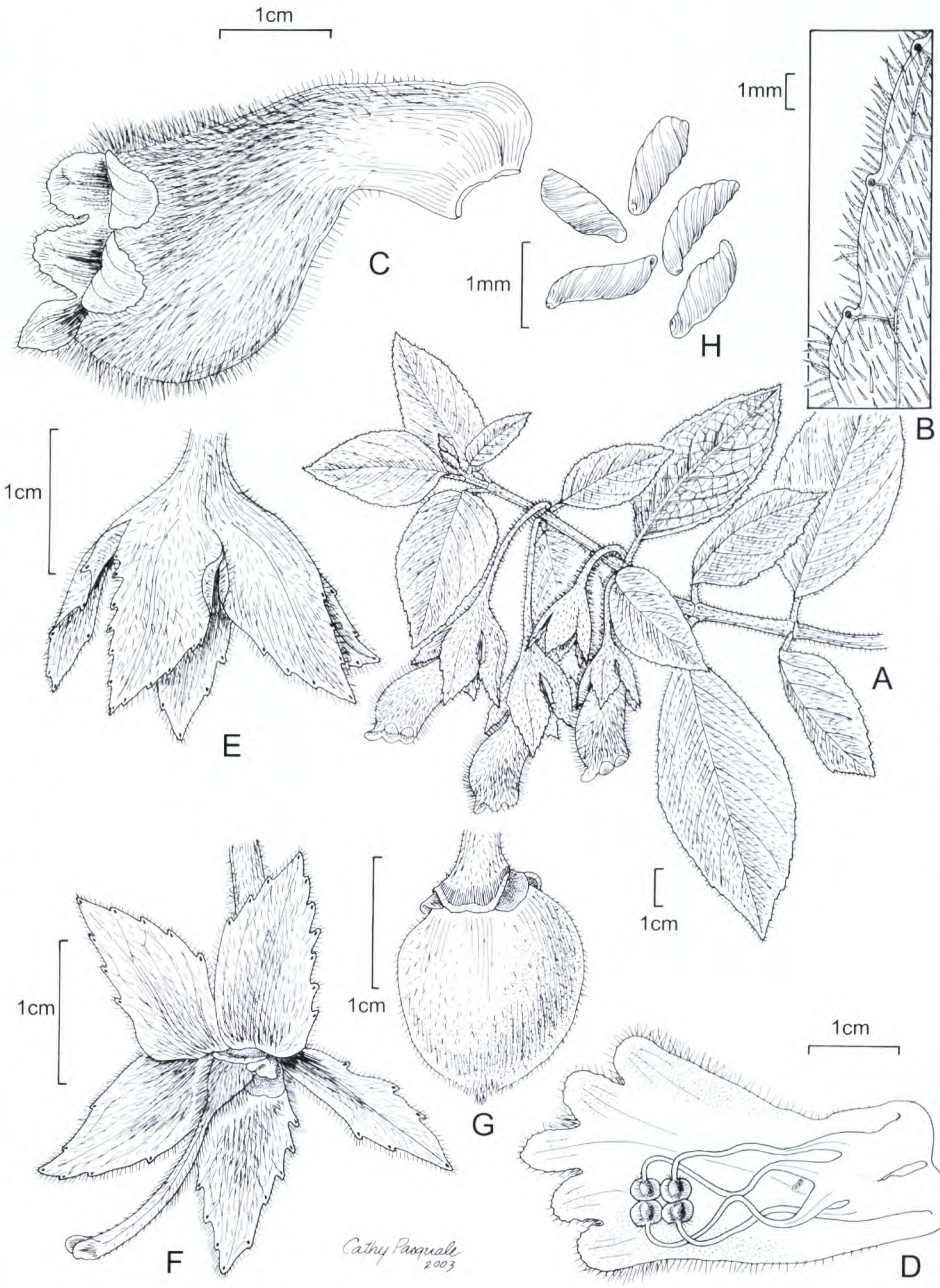

Figure 2. *Alloplectus inflatus* J. L. Clark & L. E. Skog. —A. Habit. —B. Adaxial leaf pubescence. —C. Corolla. —D. Corolla opened to show stamens. —E. Calyx. —F. Calyx opened and corolla removed to show bilobed nectary gland. —G. Immature fruit. —H. Seeds. (A, B from *L. Uribe U. 2594*, US; C–F from *G. Huertas & L. A. Camargo 5007*, COL; G, H from *F. W. Pennell 9383*, PH.)

tral (Caldas, Cauca, Tolima) and the Cordillera Oriental (Boyacá, Cundinamarca, Meta) from 2000 to 3500 m.

Alloplectus inflatus resembles the type species for the genus, *A. hispidus* (Kunth) Martius, but differs by the more inflated and remarkable pouched region near the apex of the corolla. Both *A. hispidus* and *A. inflatus* are scandent herbs, but *A. hispidus* can cover an entire tree trunk for 3–5 m, whereas *A. inflatus* is not so prolifically branched (pers. obs.). Other characters that are useful for distinguishing *A. inflatus* are the dark red flowers and the nearly valvate calyx lobes with basally appressed margins.

Paratypes. COLOMBIA. **Boyacá:** Cordillera Oriental, NE of Arcabuco, border of Boyacá & Santander del Sur, *H. García Barriga & R. Jaramillo M. 20261* (F, GH, US). **Caldas:** Cordillera Central, Alaska, above Salento, *F. W. Pennell 9383* (GH, PH); W slopes of the Cordillera Central, valley of Río Otun, Peña Bonita, *J. Cuatrecasas 23333* (F, US). **Cauca:** E slopes Cordillera Central, region of Moscopan, valley of Río San José, Aguabonita, *J. Cuatrecasas 23484* (F, US); road Popayán–La Plata, km 100, Res. For. Merenberg, *C. Murcia 12* (COL). **Cundinamarca:** betw. Puebloviejo & Hoerías, near Boca de Monte, *L. Uribe U. 6387* (COL); Cerros de San Miguel, SW of La Sabana de Bogotá, *L. Uribe U. 2594* (COL, US); Cordillera Oriental, Moquentiva valley, 14 km NW of Gachetá, *M. L. Grant 9522* (NA, US); Sibate, El Peñón, *G. Huertas & L. A. Camargo 5007* (COL); Páramo de Guasca, *M. Schneider 1196* (COL); vic. San Miguel, *R. E. Weaver & H. Kennedy 1567* (GH). **Meta:** E slopes of the Cordillera Central, Sunapás, Quebrada El Buque, *S. Díaz P. 2677* (MO); main tributary of Rio Grande, S of Cordillera de Las Cruces, S slopes of Paramo de Sumapaz, *F. R. Fosberg 20862* (US); Quetame, Guayabetal police inspection station, road to Calvario, *G. Lozano C. 4063* (COL), *L. Peñuela & J. Clavijo 16* (COL). **Tolima:** near Quindio hwy., along divide, *E. P. Killip & G. Varela 34612* (COL, US).

Alloplectus oblongicalyx J. L. Clark & L. E. Skog, sp. nov. TYPE: Ecuador. Pichincha: Cantón Quito, trail betw. Lloa & Mindo, 30 km W of Lloa, 00°11′S, 78°41′W, 1800 m, 12 Feb. 1997, *J. L. Clark & S. C. Clark 3903* (holotype, QCNE; isotypes, AAU, MO, NY, US). Figure 3.

Ad *A. grandicalycem* similis sed in lobis calycis oblongis et in corollis uniformiter roseis differt.

Herbs to subshrubs; terrestrial, stems erect, unbranched; to 3.0 m tall, usually woody, succulent when young, terete to quadrangular, glabrescent or glabrous, sometimes sparsely pubescent. *Leaves* opposite, usually equal in a pair; petioles 5–12 cm long, sparsely to densely pilose; blades coriaceous when dry, elliptic, 12–22 × 8–15 cm, base acute to rounded, apex acute to obtuse, margin serrate or serrulate, adaxially green, sparsely strigose, abaxially all green to all red, glabrous to sparsely pilose on veins. *Inflorescence* epedunculate, reduced cyme, appearing fasciculate, with 3 to 5 flowers per node, bracteoles ovate, ca. 20 × 8 mm; pedicels shorter than the petiole, 3–5 cm long, pilose. *Flowers* zygomorphic, resupinate; calyx lobes 5, nearly free, each appressed to adjacent lobe, folded lengthwise with the margin curved inward, erect, 4 equal, oblong, 4–5 × 20–30 mm, base cordate, apex obtuse, margin serrulate or entire, all green, all red, or mostly red with green-white at base, outside pilose at the base, sparsely pilose above, inside sparsely pilose, fifth (dorsal) lobe smaller and narrower, oblong, 3–4 × 0.5–1 cm; corolla oblique in calyx, 5–6.5 cm long, tubular, tube 4.5–6 cm long, gibbous posteriorly on lower surface, spur absent; base 0.5–1 cm diam., middle ampliate, becoming ventricose on upper surface, throat not constricted, appearing laterally compressed, 13 mm wide (at mouth), usually uniformly dark red, sometimes appearing orange to vermillion, outside sparsely sericeous becoming densely sericeous distally, inside mostly glabrous, becoming glandular apically, limb reflexed, to 1.5 cm wide, lobes nearly equal, rotund, spreading, slightly recurved, 4–5 × 4.5 mm, rounded, entire; nectary gland bilobed, on ventral surface of ovary, glabrous; stamens 4, didynamous, included; filaments coiling after anthesis, ca. 2.5 cm long, connate at base for 5 mm, adnate to base of corolla tube for ca. 5 mm, glabrous; anthers broader than long, ca. 1 × 3 mm, dehiscing by longitudinal slits; staminode absent; ovary ovoid, ca. 5 × 4 mm, densely pilose, style 3–4 cm long, glabrous, stigma stomatomorphic. *Fruit* a fleshy capsule, pendent when ripe, ovoid, bivalved, ca. 2 × 1.3 cm, pilose; seeds numerous, fusiform, 0.9 × 0.3 mm, longitudinally striate, brownish red.

Phenology. Flowering and fruiting throughout the year.

Distribution (Fig. 5). *Alloplectus oblongicalyx* is known from the northwestern Andean slopes of Ecuador and southern Colombia from 1400 to 3200 m. Despite its distribution from the eastern Andean slopes in Colombia (Cordillera Oriental), it has not been found on the adjacent eastern slopes in Ecuador. This could be the result of displacement by the congener *Alloplectus grandicalyx* J. L. Clark & L. E. Skog where the ranges of these two species would be expected to overlap.

Alloplectus oblongicalyx is distinguished from other members of the genus by the combination of uniformly colored corollas, an erect unbranched habit, and calyx lobes that are conspicuously ob-

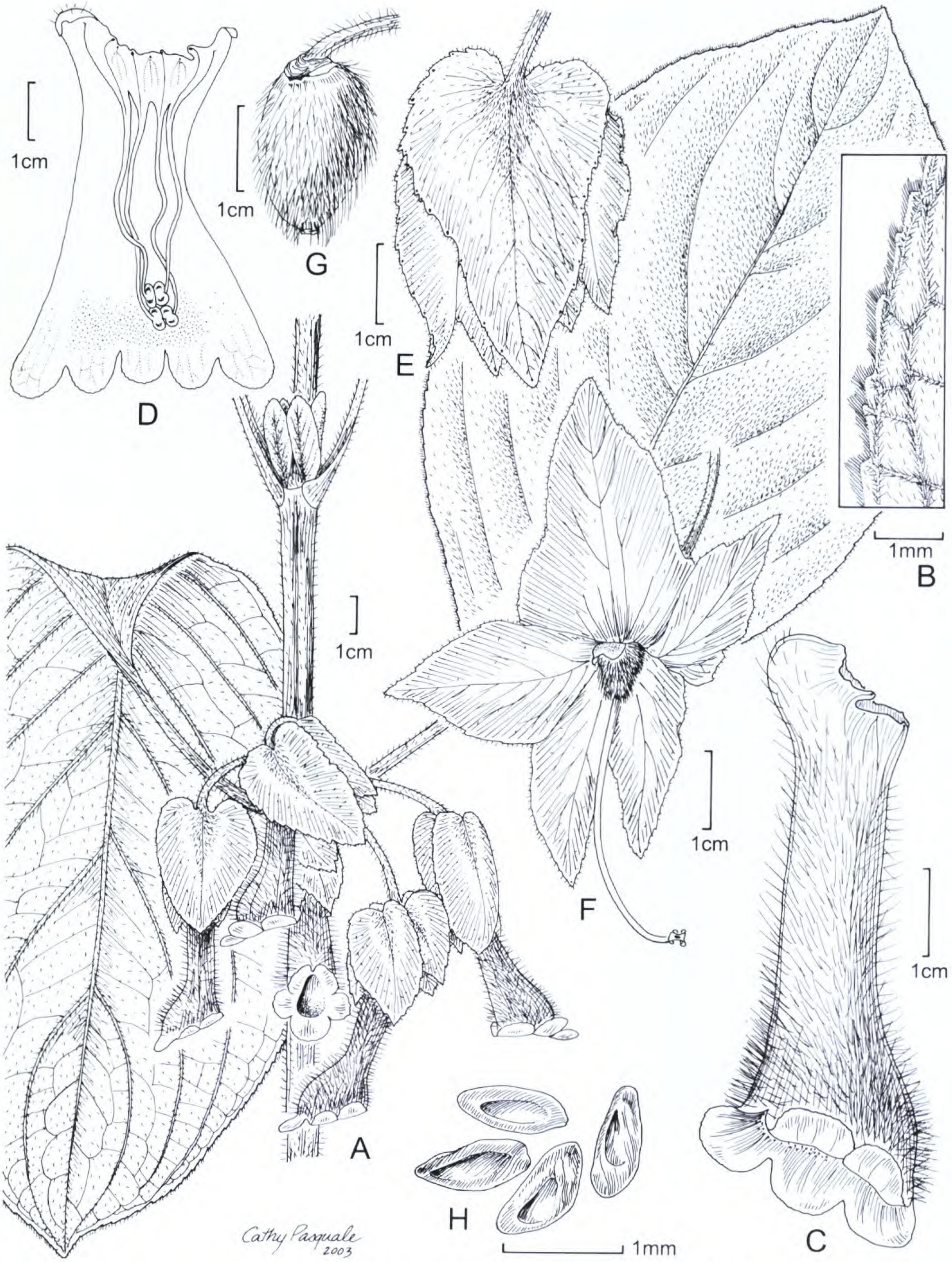

Figure 3. *Alloplectus oblongicalyx* J. L. Clark & L. E. Skog. —A. Habit. —B. Abaxial leaf pubescence. —C. Corolla. —D. Corolla opened to show stamens. —E. Calyx. —F. Calyx opened and corolla removed to show bilobed nectary gland. —G. Immature fruit. —H. Seeds. (A from *V. Zak & J. Jaramillo 2311*, US; B from *G. L. Webster & B. Castro 30250*, US; C, D, G, H from *J. L. Luteyn, J. J. Pipoly, M. Lebron-Luteyn & J. A. Kallunki 8819*, US; E, F from *J. L. Clark & S. G. Nazzaro 4588*, US.)

long. *Alloplectus oblongicalyx* resembles *A. grandicalyx*, and some of the paratypes for the latter (Clark & Skog 2002) are considered here as belonging to *A. oblongicalyx*. The oblong calyx lobes in *A. oblongicalyx* is the most consistent character for differentiating it from the congener, *A. grandicalyx*. The color of the calyx lobes in *A. oblongicalyx* is variable and ranges from greenish-white to red. The color of the leaves also varies from green to red. Many of the herbarium collections of *A. oblongicalyx* were annotated as *A. tetragonoides* Mansfeld or *A. tetragonus* (Hanstein) Hanstein. The calyx lobe margin of *A. oblongicalyx* is serrulate or entire in contrast to the deeply serrate margins of *A. tetragonus*. The calyx lobes of *A. tetragonoides* are smaller and more ovate than *A. oblongicalyx*.

Paratypes. COLOMBIA. **Caquetá:** Cordillera Oriental, road Guadalupe–Florencia, km 14, *X. Londoño & L. P. Kvist 99* (COL, QCA, US); E slopes of the Cordillera Oriental, Quebrada Río Hacha, *J. Cuatrecasas 8553* (COL, US). **Cauca:** Santa Rosa, Finca Teresa (El Cajón), 2 km above Quebrada San Antonio, near Cerro La Vieja, *L. J. Rubiano & C. Moreno O. 507* (COL). **Huila:** confluence of Río Villalobos & Río Cauchos, *R. E. Schultes & M. Villarreal 5204* (COL, GH, US); road La Plata–Popayan, km 101, *B. A. Stein 3730* (COL, K, MO, US); route tow. Agua Bonita, *S. Díaz P., C. Lozano & J. Torres R. 729* (COL); San José de Isnos, route tow. El Hornito, *G. Lozano C. 3361* (COL); W slope of Cordillera Oriental, bel. Gabinete, ravine above San Andrés, *J. Cuatrecasas 8620* (COL, US). **Putumayo:** E slopes of Cordillera Oriental, betw. Sachamates & San Francisco de Sibundoy, *J. Cuatrecasas 11460* (COL, US); Sibundoy, betw. San Francisco & Río Blanco, vía a Mocoa, *E. Hernández, A. Guerrero & A. Estrada 401* (US); road San Francisco–Mocoa, km 92 from Pasto, sitio Los Monos, *T. Plowman & W. Davis 4332* (COL); Valle de Sibundoy, 1.5 km E Sibundoy, *M. L. Bristol 366* (COL, GH, US). ECUADOR. **Carchi:** above Maldonado, *H. van der Werff & E. Gudiño 10808* (MO, QCNE, US); road Tulcán–Maldonado, ca. 13 km SE of Maldonado, *G. Harling & L. Andersson 12336* (GB, SEL, US). **Cotopaxi:** Cantón Sigchos, Parroquia San Francisco de las Pampas, Bosque Integral Otonga, *J. L. Clark & A. Muñoz 6141* (QCNE, US). **Pichincha:** 32.2 km W from Cotocollao, E near bridge across Río Alambi, *B. MacBryde 100* (QCA, US); Cantón Quito, Bellavista Lodge, next to Mindo Nambillo Reserve, ca. 6 km S of Tandayapa, *J. L. Clark, H. Greeney, M. Lysinger & T. Walla 3531* (QCNE, US); Cordillera de los Yumbos, trail La Victoria–Chiriboga, *J. L. Clark & S. G. Nazzaro 4588* (AAU, COL, E, MO, QCA, QCNE, SRP, US); Parroquia Calacalí, Reserva Geobotánica Pululahua, Sta. Rita, *C. E. Cerón M., M. Cerón & S. Chipantasi 4762* (MO, QCNE, US); Parroquia Nanegal, Bosque Protector Maquipucuna, above Río Pichán, *G. L. Webster & B. Castro 30250* (DAV, QCNE, US); Parroquia Nono, El Pahuma Orchid Reserve, *J. L. Clark, W. Elcome, M. Elcome, N. Harris & M. Mailloux 7654* (QCNE, US); road Quito–Nono, 12–14 km WNW of Nono, *J. L. Luteyn, J. J. Pipoly, M. Lebron-Luteyn & J. A. Kallunki 8819* (CAS, NY, QCA, QCNE, US); hwy. Quito–Chiriboga–Empalme, betw. km 75 and 85, *V. Zak & J. Jaramillo 2311* (MO, NY, US).

Alloplectus serpens J. L. Clark & L. E. Skog, sp. nov. TYPE: Ecuador. Morona-Santiago: Cantón Limón-Indanza, main road betw. Gualaceo & Plan de Milagro, "Tinajíllas," cow pasture & patches of montane forest, 03°00′19″N, 78°36′36″W, 2800 m, 10 Jan. 2001, *J. L. Clark, F. Sanchez & L. Jost 5904* (holotype, QCNE; isotypes, AAU, HA, K, MO, NY, QCA, US). Figure 4.

Ad *A. carpishensem* similis sed in lobis calycis oblongioribus apice rotundatis differt.

Lianas to subshrubs; epiphytic, stems scandent or erect, rarely branched; to 2.0 m long, subwoody, subquadrangular, glabrescent below, densely hirsute above. *Leaves* opposite, equal in a pair; petioles 1–5 cm long, densely yellow pilose; blades membranous when dry, ovate, 4–15 × 3–10 cm, base acute to rounded, apex acuminate, margin serrate to crenate, adaxially green, sparsely pilose, abaxially uniformly pale green to uniformly red, sparsely to densely pilose, especially on veins. *Inflorescence* epedunculate, reduced cyme, appearing fasciculate, with 1 to 3 flowers per node; bracteoles ovate, 1–2 × 0.5–1.0 cm; pedicels shorter to longer than the petiole, 1–3.5 cm long, densely pilose. *Flowers* zygomorphic, resupinate; calyx lobes 5, nearly free, each appressed to adjacent lobe, folded lengthwise with the margin curved inward, erect, subequal, ovate, 20–25 × 20–25 mm, base sagittate, apex rounded, margin serrate, red, outside sparingly pilose with the midvein densely pilose, inside pilose; corolla horizontal in calyx, 2–4 cm long, tubular, tube 2–4 cm long, gibbous posteriorly on lower surface, spur absent; base 9–11 mm diam., middle ampliate, becoming ventricose on upper surface, throat slightly constricted, appearing laterally compressed, to 1.5 cm (at mouth), outside glabrous at base, otherwise densely pilose, inside glabrous, limb reflexed, ca. 0.5 cm wide, lobes nearly equal, rotund, ca. 5 × 3 mm, rounded, entire; nectary gland bilobed, on ventral surface of ovary, glabrous; stamens 4, didynamous, included; filaments coiling after anthesis, to 1.9 cm long, connate at base for 8 mm, adnate to base of corolla tube for ca. 8 mm, glabrous; anthers broader than long, 1.3 mm long, 2.6 mm wide, dehiscing by longitudinal slits; staminode absent; ovary ovoid, ca. 5 mm long, ca. 4 mm wide, densely pilose, style to 2.4 cm long, glabrous, stigma stomatomorphic. Fruits and seeds not observed.

Phenology. Flowering throughout the year with collections of mature flowers made in January, February, March, May, and December.

Distribution (Fig. 5). *Alloplectus serpens* is

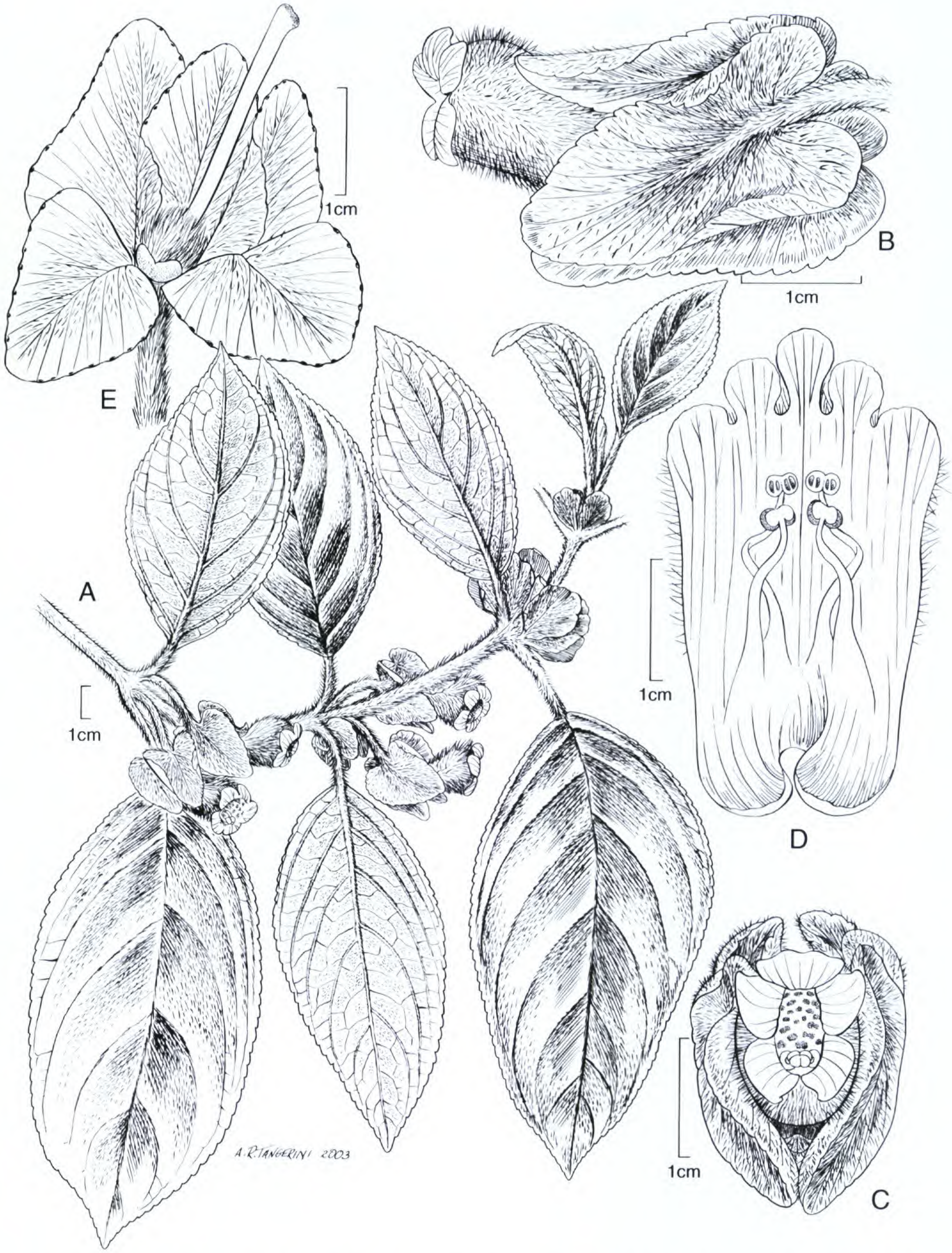

Figure 4. *Alloplectus serpens* J. L. Clark & L. E. Skog. —A. Habit. —B. Side view of flower. —C. Face view of flower. —D. Corolla opened to show stamens. —E. Calyx opened and corolla removed to show bilobed nectary gland. (A–D from *J. L. Clark, M. Thurber & D. Ranosa 5627*, US; E from *J. L. Clark, F. Sanchez & L. Jost 5900*, US.)

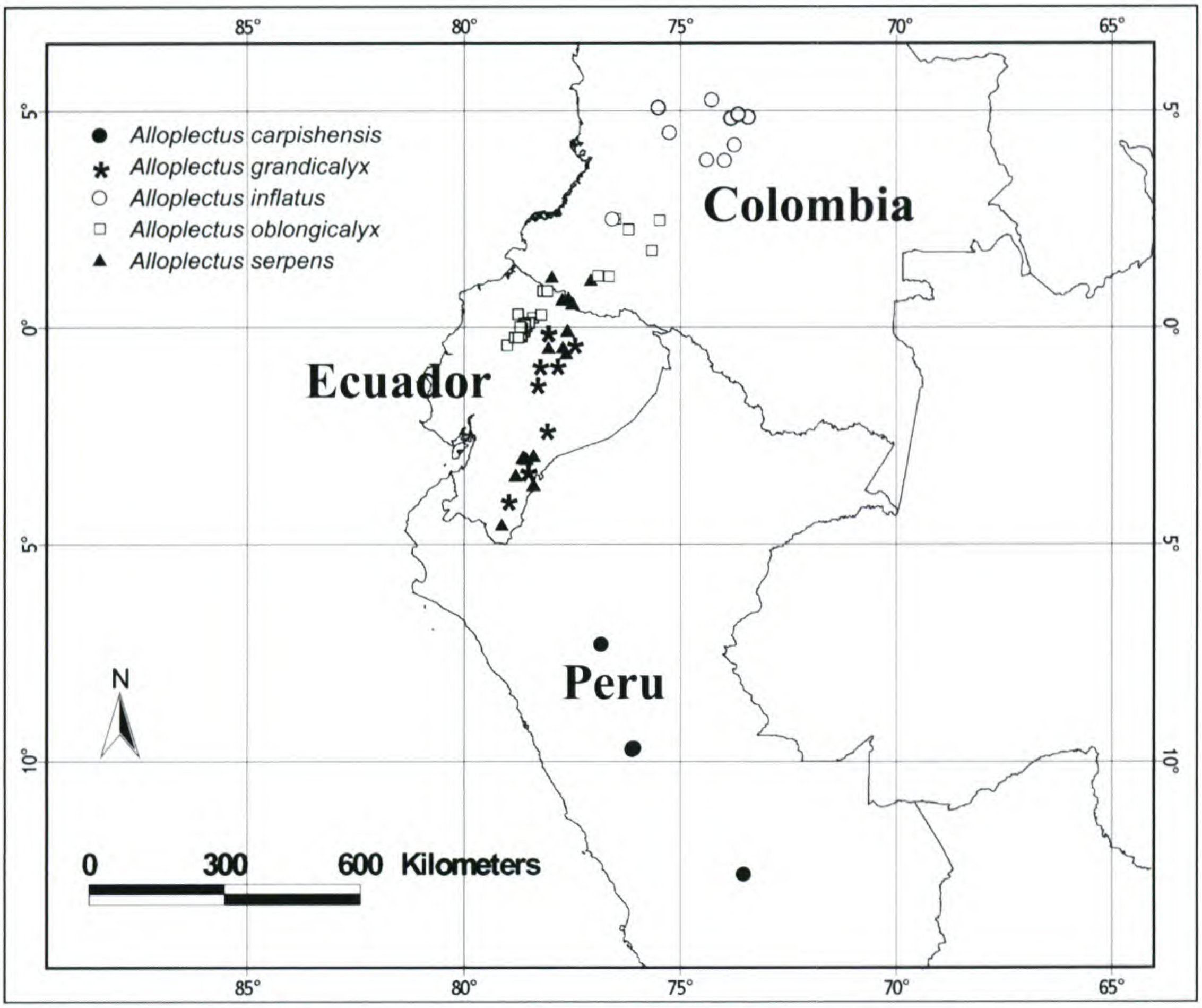

Figure 5. Distribution of *Alloplectus carpishensis*, *A. grandicalyx*, *A. inflatus*, *A. oblongicalyx*, and *A. serpens*. Each symbol represents collections from specific localities cited on herbarium collections. Maps were generated using ArcView GIS 3.2a (ESRI, 2000).

known from the eastern Andean slopes of Ecuador and the southern Andes of Colombia from 1500 to 3200 m.

For the distinguishing characters of *A. serpens*, see the discussion of *A. carpishensis* above.

Paratypes. COLOMBIA. **Nariño:** R. N. La Planada, 7 km from Chucunés, *O. Benavides 8989* (MO, US). **Putumayo:** edge of La Cocha Lagoon, Quebrada de Santa, *J. Cuatrecasas 11827* (COL, F, US). ECUADOR. **Carchi:** 17.5 km E of Santa Barbara, road Tulcan–Alegria via Caramelos & Santa Barbara, *C. H. Dodson & A. H. Gentry 12124* (MO, QCNE, SEL). **Morona-Santiago:** Cantón Limón Indanza, hwy. Gualaceo–Plan de Milagro, *J. L. Clark, F. Sanchez & L. Jost 5900* (HA, QCA, QCNE, US); E slopes of Matanga Paramo, ca. 30–40 km S of Sigsig, road tow. Gualaquiza, *J. L. Luteyn & E. Cotton 11191* (QCNE, US); road Gualaceo–Limón, km 35.5, *P. M. Jørgensen, C. Ulloa & B. Øllgaard 92879* (AAU, QCNE). **Napo:** betw. Santa Barbara and La Bonita, *G. Harling & L. Andersson 12510* (GB, SEL, US); Cantón Archidona, P. N. Sumaco Napo-Galeras, near Volcán Sumaco crater, *J. L. Clark 2264* (QCNE, US); Cantón Quijos, Parroquia Cuyuja, N border of Res. Ecol. Antisana, betw. the town of Cuyuja and the confluence of Río Tablon and Río Quijos, *J. L. Clark, M. Thurber & D. Ranosa 5627* (QCA, QCNE, US); Cantón Sucumbios, Playón de San Francisco, road Sta. Bárbara–La Bonita, *J. Jaramillo 9328* (GB); Guagra Urcu, small hill SE of summit, *L. Holm-Nielsen, J. Jaramillo, F. Coello & E. Azanza 27633* (AAU, MO). **Sucumbios:** E slopes of Volcán Reventador, Res. Ecol. Cayambe Coca, *J. L. Clark 4428* (QCNE, US). **Zamora-Chinchipe:** above Valladolid, on road to Yangana, *G. Harling & L. Andersson 21391* (GB, US); El Pangui, Cordillera del Cóndor, near military base Cóndor Mirador, *T. Montenegro 154* (QCNE, US).

Acknowledgments. Support for this project for the first author was provided by the Elvin McDonald Research Endowment Fund of the American Gloxinia and Gesneriad Society, the National Science Foundation (DEB 0206512), the Explorers Club Washington Group, and a Fulbright Graduate Study and Research Abroad Scholarship. We are grateful to Cathy Pasquale-Johnson and Alice Tangerini for preparing illustrations of the new species and Tom Hollowell for help in preparing the dis-

tribution map. Hamilton Beltran is also acknowledged for his guidance in the fieldwork component in Peru. We are especially grateful to James Smith, John Boggan, Christian Feuillet, and an anonymous reviewer for their helpful comments on the manuscript and Harold Robinson for assisting with the Latin diagnoses.

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New Species of Araceae from Bolivia and the Tropical Andes

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ABSTRACT. A total of 16 taxa (15 species and 1 variety) of Araceae are new to science. These include *Anthurium acebeyae* Croat, *A. beckii* Croat & Acebey, *A. besseae* Croat, *A. kunthii* Poeppig var. *cylindricum* Croat, *A. ottobuchtienii* Croat & Acebey, *A. stephanii* Croat & Acebey, *A. yungasense* Croat & Acebey, *Dieffenbachia williamsii* Croat, *Monstera kessleri* Croat, *Philodendron cotapatense* Croat & Acebey, *P. kroemeri* Croat, *Rhodospatha mukuntakia* Croat, *Stenospermation dictyoneurum* Croat & Acebey, *S. killipii* Croat & A. Gomez, *Xanthosoma puberulum* Croat, and *X. seidelii* Croat.

RESUMEN. Un total de 16 taxones (15 especies y 1 variedades) de Araceae son nuevas para la ciencia. Estas incluyen *Anthurium acebeyae* Croat, *A. beckii* Croat & Acebey, *A. besseae* Croat, *A. kunthii* Poeppig var. *cylindricum* Croat, *A. ottobuchtienii* Croat & Acebey, *A. stephanii* Croat & Acebey, *A. yungasense* Croat & Acebey, *Dieffenbachia williamsii* Croat, *Monstera kessleri* Croat, *Philodendron cotapatense* Croat & Acebey, *P. kroemeri* Croat, *Rhodospatha mukuntakia* Croat, *Stenospermation dictyoneurum* Croat & Acebey, *S. killipii* Croat & A. Gomez, *Xanthosoma puberulum* Croat, and *X. seidelii* Croat.

Key words: *Anthurium*, Araceae, Bolivia, *Dieffenbachia*, floristics, *Monstera*, *Philodendron*, *Rhodospatha*, *Stenospermation*, *Xanthosoma*.

In preparation of the Araceae treatment for the checklist of Bolivian plants being carried out at the Missouri Botanical Garden, we have discovered a number of taxa that are new to science. A complete treatment of the Araceae of Bolivia, including provisional descriptions of many species believed to be new but for which there is inadequate material to describe, will eventually be available on the the Missouri Botanical Garden web page: http://www.mobot.org/MOBOT/Research/southamericaprojects.shtml/bolivia. This will include a key to the species of *Dieffenbachia*, *Monstera*, and *Stenospermation* for Bolivia as well as full descriptions and complete exsiccatae for species in other Araceae genera.

ANTHURIUM

Anthurium acebeyae Croat, sp. nov. TYPE: Bolivia. La Paz: Nor Yungas, 14.3 km NE of Chuspipata, 16°14′S, 67°47′W, 2000 m, 23 Mar. 1984, *J. Solomon, B. Stein & M. Uehling 12090* (holotype, MO-3213306; isotypes, K, LPB, US). Figure 1.

Planta epiphytica; internodia 1–2 cm longa, 1.7 cm diam.; cataphylla 11–15 cm longa, persistentia semi-intacta; petiolus 30–54 cm longus, subteres; lamina triangulari-sagittata, 41–54.5 cm longa, 23–28 cm lata; lobuli postici 11–16.5 cm longi, 8–10 cm lati; nervis primariis lateralibus 8–10 utroque; pedunculus 23–39 cm longus; spatha viridis, 8.5–15 cm longa, 1.1–1.5 cm lata; spadix 7.5–22.5 cm longus, 4–9 mm diam., stipitatus 3–20 mm, viridis.

Epiphyte; *internodes* 1–2 cm long, 1.7 cm diam.; *cataphylls* 11–15 cm long, dark brown persisting semi-intact with apex remaining intact and pale fibers showing toward the base, sometimes forming an almost completely fibrous network. *Petioles* 30–54 cm long, about half as long as blades, subterete, narrowly, obtusely and shallowly sulcate, semiglossy, medium green, drying dark brown to blackened. Leaf *blades* triangular-sagittate, 41–54.5 × 23–28 cm, 1.7–2.2 times longer than wide, deeply lobed at base, acuminate at apex, subcoriaceous, medium to dark green and semiglossy above, slightly paler and glossier below, drying dark green to dark brown above, yellow-green to yellow-brown below; posterior lobes 11–16.5 × 8–10 cm, usually directed downward, sometimes somewhat outward; anterior lobes straight to broadly concave; basal veins 6 to 8, 1st pair free to base, 2nd pair sometimes free to base, 4th and higher order pairs coalesced 5–6 cm; posterior rib naked for 2.5–5.5 cm; *midrib* narrow, slightly paler and bluntly acute above, paler and narrowly round-raised below, drying concolorous or slightly darker than surface, sometimes acute

Figure 1. A–D. *Anthurium acebeyae* Croat (*Croat et al. 84274*). —A. Habit. —B. Leaf blade adaxial surface. —C. Close-up of inflorescence. —D. Stem with cataphylls and petiole bases.

above, darker or lighter than surface below; *primary lateral veins* 8 to 10 pairs, arising at 30°–50° angle to midrib, weakly quilted-sunken and concolorous above, narrowly raised and slightly paler below; tertiary veins mostly not raised, drying darker than surface. INFLORESCENCE erect; *peduncle* 23–39 cm long; *spathe* green, 8.5–15 × 1.1–1.5 cm, reflexed-spreading; *spadix* 7.5–22.5 cm × 4–9 mm, stipitate for 3–20 mm, medium to dark green, semiglossy. Flowers 1.8–2.2 mm long, 7 to 9 visible per spiral; lateral tepals 0.9–1.0 mm wide, inner margin rounded, outer margin 2-sided; anthers 0.4 × 0.6 mm; pollen white.

Distribution and habitat. *Anthurium acebeyae* is endemic to Bolivia in La Paz (Nor Yungas, Sur Yungas, Caranavi) and Cochabamba (Carrasco) Departments at 1500–2300 m elevation in a *Premontane moist forest* (P-mf) life zone (Holdridge et al., 1971). The new species is a member of section *Belolonchium* Schott emend. Engler, and is characterized by its epiphytic habit, short internodes, persistent, semi-intact cataphylls, triangular-sagittate leaf blades with the margins usually concave, and the long-pedunculate inflorescence with a stipitate green spadix.

Anthurium acebeyae is most likely to be confused with the widespread and variable *A. incurvatum* Engler, which also occurs in the highlands of Bolivia, but it is distinguished from that species by its concave blade margins and green inflorescences (the spathe with conspicuously convex blade margins and the spadix purple to violet-purple in *A. incurvatum*). The new species can also be confused with *A. yungasense* Croat, which shares similar persistent cataphylls and stipitate green spadices, but differs in having semiglossy to glossy blades that are convex along the margins of the anterior lobes. In addition, the spadix of *A. acebeyae* is usually much more conspicuously stipitate (frequently by 1–2 cm).

The species is named in honor of Amparo Acebey, Bolivian aroid specialist and coauthor of this paper, who assisted in collecting the type specimen.

Paratypes. BOLIVIA. **Cochabamba:** Carrasco, Cochabamba–Villa Tunari, km 141 on old rd., *Kessler et al. 7730* (LPB, MO). **La Paz:** Caranavi, Serranía Bella Vista, 37 km from Caranavi on the rd. to Sapecho, *Kessler et al. 11345* (LPB, MO); Nor Yungas, Caranavi–Yucumo, 37.6 km NE of Caranavi, *T. B. Croat et al. 84274* (B, COL, LPB, MO, NY, USM); NE of La Paz, 5.4 W of rd. to Coroico, *Croat 51459* (LPB, MO); 16.5 km NE of Chuspipata, 13.6 km SW of Yolosa, *J. Solomon & Uehling 12166* (LPB, MO); Cotapata NP, *T. Kroemer & Acebey 979* (LPB); Est. Biol. Tunquini, senda del pajonal, atrás del Río Cedroni, *K. Bach et al. 970* (LPB); Bajo Hornuni, trail to the camp of Don Pedro, trail to the mine, *D. Quintana et al. 5* (LPB, MO), *Bach et al. 970* (LPB, MO), *García et al. 4391* (LPB, MO), *4431* (LPB, MO); Sud Yungas, Huancané, 6.5 km S, on new rd., *S. Beck 3058* (LPB, MO).

Anthurium beckii Croat & Acebey, sp. nov. TYPE: Bolivia. La Paz: Abel Iturralde, Tumupasa-San José de Uchupiamonas, NW of Tumupasa along slope leading up to Madidi NP, 5.5–5.8 km above jct. in main rd. near Tumupasa, 15°45′N, 67°50′W, 830–850 m, 9 Aug. 2000, *T. B. Croat, A. Acebey & T. Kroemer 84387* (holotype, MO-5187101; isotypes, K, LPB, NY, US). Figure 2A.

Planta epiphytica; internodia brevia, 1 cm diam.; cataphylla 3.5 cm longa, semi-intacta, persistentia, fibris inferne; petiolus teres, 5–15 cm longus, 1.5 mm diam.; lamina oblongo-lanceolata, 25–36 cm longa, 1.2–4.5 cm lata; nervis primariis lateralibus 5–7 utroque; pedunculus (13)26–36.5 cm longus, 1.5–2.5 mm diam.; spatha lanceolata, 4.3–5.5 cm longa, 5–7 mm lata, ex purpureo viridis; spadix atropurpureus, 7–10.5 cm longus.

Epiphyte; *internodes* short, 1 cm diam.; *cataphylls* 3.5 cm long, semi-intact, the fibers parallel, promptly becoming fibrous with paler brown fibers. *Petioles* terete, 5–15 cm long, 1.5 mm diam. on drying, medium green, weakly glossy, drying light yellow-brown. Leaf *blades* oblong-lanceolate, sometimes weakly falcate, 25–36 × 1.2–4.5 cm, 9–11 times longer than wide, coriaceous, matte, acute to very narrowly rounded at the base, narrowly acuminate at apex, moderately bicolorous, dark green above, moderately paler below, drying dark olive-green to dark yellow-brown above, moderately paler and yellow-brown below; *midrib* narrowly raised and ± concolorous above, bluntly raised and paler below; *primary lateral veins* 5 to 7 pairs, scarcely visible on fresh leaves, arising at 15°–20° angle from midrib, drying flat to deeply sunken above, scarcely visible on lower surface; collective veins arising from the base, drying weakly raised and conspicuously more prominent than primary lateral veins on lower surface, flattened to sunken on upper surface; tertiary veins obscure. INFLORESCENCE erect; *peduncle* (13)26–36.5 cm long, 1.5–2.5 mm diam., terete, tinged purple; *spathe* spreading, lanceolate, 4.3–5.5 cm long, 5–7 mm wide, green, tinged purple to violet-purple, matte; *spadix* dark violet-purple, matte, 7–10.5 cm long. Flowers 3 or 4 per spiral, 2.4–2.6 × 1.8–2.2 mm; lateral tepals 1.6–1.8 mm wide, the inner margin very broadly rounded, outer margin 2-sided; pollen pale orange. *Berries* orange, subglobose, 6 mm long, 4–5 mm diam.

Distribution and habitat. *Anthurium beckii* is endemic to Bolivia, where it is known only from the

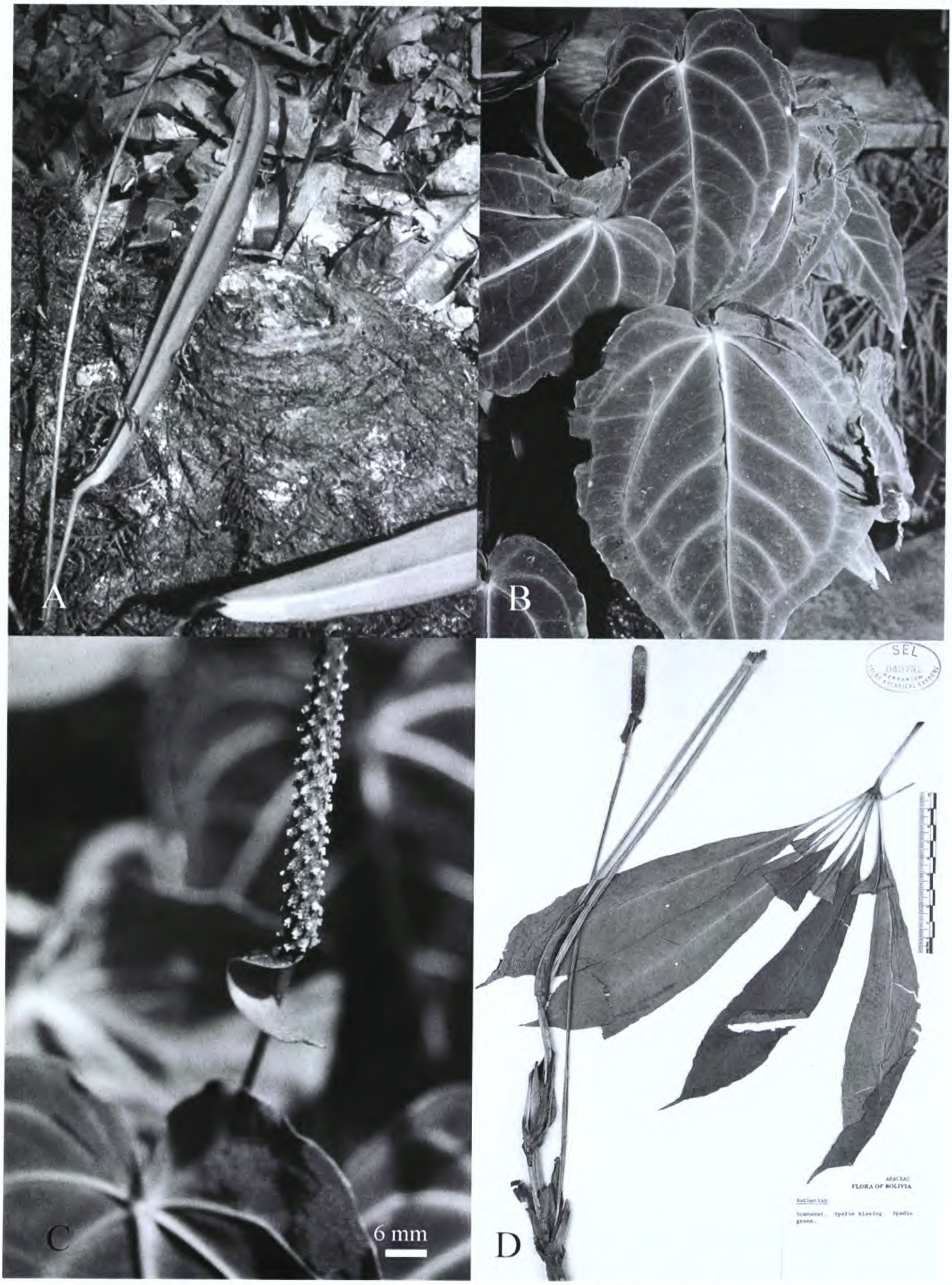

Figure 2. —A. *Anthurium beckii* Croat & Acebey (*Croat et al. 84387*). Habit. B, C. *Anthurium besseae* Croat (*Croat 71836*). —B. Habit. —C. Close-up of leaf and inflorescence. —D. *Anthurium kunthii* var. *cylindricum* Croat (*Besse et al. 1790*). Herbarium specimen.

mountains of northeastern La Paz Department in the provinces of Abel Iturralde, J. Bautista Saavedra, Franz Tamayo, Sud Yungas, and Caranavi at 600–1550 m.

The new species is a member of section *Porphyrochitonium* Schott and is superficially close to *Anthurium friedrichsthalii* Schott, which ranges from Costa Rica to western Colombia, but is not found in the Amazon basin. The latter species differs in being a pendent epiphyte with proportionately longer leaves (to 14–16 times longer than wide) with the upper blade surface epunctate and in having a spadix that is green at anthesis (turning brownish in age). In contrast, *A. beckii* is a more or less erect herb, with leaf blades no more than 11 times longer than wide and glandular-punctate on both surfaces, and has a spadix that is dark purple at anthesis.

Paratypes. BOLIVIA. **La Paz:** Caranavi, Serranía Bella Vista, Caranavi–Sapecho, km 47, *P. Kessler et al. 11664* (LPB, MO); Saavedra, Pauji–Yuyo, km 3, Apolo–Charazani, *Kessler et al. 9732* (LPB, MO); Sud Yungas, Alto Beni, Sapecho, Colonia 16 de Julio, subiendo la senda hacia la antena de ENTEL, *Kroemer & Acebey 711* (LPB, MO); Tamayo, Apolo–Charazani, km 52, bey. Correo, Campamento Calabatea, *S. Beck & R. Foster 18577* (LPB); Campamento Alto Limón, Limón–Mara, trail San José–Apolo, *Helme 556* (LPB, MO).

Anthurium besseae Croat, sp. nov. TYPE: Bolivia. Cochabamba: Chapare, old rd. from Cochabamba to Villa Tunari, vic. Villa Tunari, 240 m, cultivated at Selby Botanical Gardens (originally collected live by *Libby Besse*, 25 Jan. 1986), 29 Sep. 1996, *T. B. Croat 79380* (holotype, MO-3301223; isotypes, B, K, LPB, NY, SEL, US). Figure 2B, C.

Planta terrestris; caudex fasciculatus, brevis; cataphylla ad 5.5 cm longa, persistentia intacta versus apicem, fibris inferne; petiolus plus minusve teres, (10)19–33 cm longus; lamina ovato-cordata vel anguste ovato-cordata, 13–33 cm longa, 8–23 cm lata; nervis primariis lateralibus 2–4 utroque; pedunculus (4)9–25(36.5) cm longus; spatha 1.3–5.5 cm longa, 2–8 mm lata, viridis; spadix 1.2–7.3 cm longus, 5–7 mm diam., atropurpureus.

Terrestrial; stems densely clustered and short; *internodes* short, ca. 1–2.5 cm diam.; *cataphylls* to 5.5 cm long, drying dark brown, persisting semi-intact in part, the remainder fibrous. *Petioles* (10)19–33 cm long, erect-spreading, ± terete, green, tinged red with white spots in lower half, matte; geniculum 2.5 cm long, 3.5 mm diam. LEAVES semi-erect with the blades ± pendent from semi-erect petioles. Leaf *blades* ovate-cordate to narrowly ovate-cordate, 13–33 × 8–23 cm, subcoriaceous, deeply cordate at base, acuminate at apex, medium dark green and velvety above, much paler to moderately paler and matte below, drying matte on both surfaces, undulate to crenulate along the margins; anterior lobe 13–26 cm long, the margins broadly rounded; posterior lobes 3.5–8.5 cm long, rounded; *midrib* and basal veins convex to sharply raised to knife-edged and paler above, marginally somewhat paler along the major veins above, drying paler than surface both above and below; midrib almost flat and paler to darker below; *primary lateral veins* 2 to 4 pairs, arising at 55°–65° angle, weakly raised to convex and much paler than surface above, weakly raised and darker below; tertiary veins weakly visible below, drying undulate; basal veins 3(4) pairs, all free to the base, weakly raised above, weakly raised and green below; sinus narrowly V-shaped to oblong or closed, 3–5 cm deep, to 8 mm diam. INFLORESCENCE erect-spreading, usually held somewhat above leaves; *peduncle* (4)9–25(36.5) cm long, 2–3 mm diam., maroon to weakly purplish-spotted; *spathe* 1.3–5.5 cm long, 2–8 mm wide, medium green, tinged maroon to purple on inner surface, minutely warty, initially erect, becoming reflexed and recurled post-anthesis; *spadix* 1.2–7.3 cm long, 5–7 mm diam., curved forward, dark purple to purplish violet, cylindroid to slightly tapered; tepals matte. Flowers 2–2.2 mm wide and long, 5 per spiral; sides straight, parallel to spiral; tepals matte, lateral tepals 1.3–1.6 mm wide, weakly pale-punctate; inner margins rounded; stamens weakly exserted at anthesis, closely aggregated; pollen orange; pistils purple, sometimes exserted. *Berries* not seen.

Distribution and habitat. *Anthurium besseae* is endemic to the type locality in Bolivia in the Department of Cochabamba, Province of Chapare, at 240 m.

The new species is a member of *Anthurium* sect. *Cardiolonchium* Schott and is distinguished by its short stem, short internodes, subterete petioles, and ovate-cordate, velvety blades with a narrow sinus or with the posterior lobes actually overlapping and with the major veins raised and much paler on the upper surface. Also characteristic is the purple spadix with slightly exserted stamens. It is superficially similar to *A. regale* Linden, from central Peru, in having velvety leaves with pale veins on the upper surface. That species typically has blades many times longer, ranging from 35 cm to about 100 cm long. *Anthurium regale* also differs in having the basal veins mostly fused into a posterior rib rather than free to the base as in *A. besseae*. In addition, *A. regale* has a creamy white rather than dark purple spadix.

The species is named in honor of Libby Besse,

long-time benefactor, Board member, and volunteer staff member of the Marie Selby Botanical Gardens in Sarasota, Florida, who sponsored many expeditions to Latin America, especially in Ecuador, and collected the live plant from which the type specimens were prepared.

Paratypes. BOLIVIA. **Cochabamba:** Chapare, along old rd. from Cochabamba to Villa Tunari, vic. Villa Tunari, *Christenson 1134* (SEL), *Ingram 972* (MO, SEL), *Ingram & Atwood 1029* (MO, SEL), *Croat 71836* (MO). All paratypes made from cultivated plant at Selby Botanical Gardens 82–85, originally collected as *Libby Besse et al.*

Anthurium kunthii Poeppig, Nov. Gen. Sp. Pl. 3: 84–85. 1845. TYPE: Peru. Loreto: Maynas, *Poeppig s.n.* (holotype, W destroyed).

Anthurium kunthii Poeppig var. **cylindricum** Croat, var. nov. TYPE: Bolivia. La Paz: Larecaja, Caranavi–Tipuani, km 60, 550 m, 24–26 Jan. 1983, *L. Besse, C. & J. Luer & R. Vásquez 1790* (holotype, SEL-04732). Figure 2D.

Ab *Anthurio kunthii* var. *kunthii* spadice clavato, lamina oblanceolata angustius et nervis primariis lateralibus debilibus differt.

Hemiepiphytic climber; *internodes* 6–9 cm long, 1 cm diam., drying moderately smooth, pale yellow-brown; *cataphylls* narrowly triangular, pale yellow-brown, persisting ± intact at upper nodes. *Petioles* subterete, 49 cm long, drying to ca. 3 mm diam., pale yellow-green. Leaf *blades* narrowly oblanceolate, 24–27.5 × 4.2–4.5 cm, gradually long-acuminate at apex, attenuate at base, drying dark yellowish brown and matte above, moderately paler, medium yellowish gray-brown and weakly glossy below; *midrib* drying narrowly raised to acute and concolorous above, thicker than broad and slightly paler than surface below, the midrib often with a weak medial sulcus; petiolules 2.5–3.5 cm long, ca. 1.5 mm diam.; *primary lateral veins* arising at 55°–65° angle, not apparent on upper surface, sometimes visible below, ca. 6 pairs, generally scarcely more apparent than interprimary veins. INFLORESCENCE erect; *peduncle* 32 cm long, drying 2.5 mm diam.; *spathe* green, 4 cm × 7 mm; *spadix* green, weakly clavate, 4.5 cm long, 8 mm diam. on drying, rounded at apex. Flowers 3.0–3.2 mm wide and long, 5 to 6 visible per spiral; lateral tepals 1.8 mm wide, the inner margin very broadly rounded, outer margin 2-sided.

Distribution and habitat. Anthurium kunthii var. *cylindricum* is endemic to Bolivia, where it is known only from the type locality in La Paz Department, Province of Larecaja.

The new variety differs from the typical variety in having blades that are more narrowly oblanceolate (vs. usually more nearly elliptic), with obscure or very weak primary lateral veins (vs. typically moderately obvious), and a clavate spadix (vs. longer and narrowly tapered).

Anthurium ottobuchtienii Croat & Acebey, sp. nov. TYPE: Bolivia. La Paz: Murillo, 44 km below Lago Zongo dam, vic. of Cahua hydroelectric plant, 16°03′S, 68°01′W, 1200 m, 12–15 Sep. 1983, *J. Solomon 10749* (holotype, MO-3158417; isotypes, B, K, LPB, NY, US, USM). Figure 3A, B.

Planta terrestris; cataphylla (5.5)10–13.5 cm longa, pro parte maxima decidua; petiolus (11)14–28 cm longus, subteres; lamina (12)17–44 cm longa, (3)4–8.0 cm lata, plerumque oblongo-lanceolata vel anguste oblongo-oblanceolata; nervis primariis lateralibus 10–14 utroque; pedunculus (6)17–25 cm longus; spatha lanceolata, (2.3)5.5–6.5 cm longa, 7–10 mm lata; spadix atroviolaceo-atropurpureus, (3)4.5–8 cm longus.

Terrestrial on steep bank; stem 30–100 cm long; *internodes* (0.5)1.0–1.5(2.5) × 1.0–1.8 cm, medium green and weakly glossy, soon gray-green to gray-brown, semiglossy, often longitudinally and narrowly ribbed, sometimes transversely cracked; *cataphylls* (5.5)10–13.5 cm long, medium green, soon dead except parts of base and thin pale fibers at upper nodes, sometimes turning brown and persisting intact at upper nodes, finally weathering to pale fibers with fragments of epidermis of the base of the cataphylls, finally completely deciduous. *Petioles* (11)14–28 cm long, drying 1–2 mm wide, subterete, oval, narrowly and sharply to obtusely flattened, sometimes weakly flattened, sometimes weakly and narrowly sulcate to deeply sulcate, sometimes sharply flattened with weak medial rib, medium green, weakly glossy. Leaf *blades* (12)17–44 × (3)4–8.0 cm, (2.7)3.4–8 times longer than wide, oblong-lanceolate to narrowly oblong-oblanceolate, sometimes ovate-elliptic to narrowly elliptic, 1.3–2.5 times longer than petioles, narrowly acuminate at apex, abruptly acute to obtuse at base (sometimes inequilateral), subcoriaceous, semiglossy, slightly bicolorous, medium to dark green above, moderately paler below, drying dark green to dark reddish brown to yellow-brown above, moderately paler and yellow-green to reddish brown below; *midrib* acute to narrowly raised and concolorous above, often in deep valleys above, narrowly raised and slightly paler below, drying acute and concolorous above, paler than surface, round-raised and brown to reddish brown, sometimes finely costate below; *primary lateral veins* 10 to 14 pairs, arising at 40°–60°(70°) angle, weakly quilted-sunk-

Figure 3. A, B. *Anthurium ottobuchtienii* Croat & Acebey (*Croat et al. 84733*). —A. Habit. —B. Close-up showing inflorescence at anthesis and young infructescence. —C. *Anthurium stephanii* Croat & Acebey (*Beck 3109*). Herbarium specimen. —D. *Anthurium yungasense* Croat & Acebey (*Croat et al. 84264*). Habit.

en and concolorous above, usually about as prominent as the collective veins above, narrowly raised and concolorous below, scarcely more prominent than the interprimary veins; collective veins arising from one of the lowermost primary lateral veins (sometimes from near the middle of the blade), or from the 1st basal veins, 1–7 mm from margin, loop-connecting the primary lateral veins. INFLORESCENCE erect to semi-erect; *peduncle* (6)17–25 cm long, less than 3 mm diam. on drying; *spathe* lanceolate, spreading, (2.3)5.5–6.5 cm × 7–10 mm, light to medium green, margin purple; *spadix* (3)4.5–8 cm long, dark purple-violet, erect to slightly curved, matte. Flowers ca. 3 visible per spiral, 2.5–4 mm long; lateral tepals shield-shaped, 1.6–2.4 mm wide, the inner margin broadly rounded, the outer margins 2-sided; pistils early-emergent. INFRUCTESCENCE to 14 cm long, nodding; *berries* subglobose, ca. 4 mm diam., dark violet-purple.

Distribution and habitat. *Anthurium ottobuchtienii* is endemic to Bolivia in the departments of La Paz (Nor Yungas, Sud Yungas, Caranavi, and Murillo) and Cochabamba (Prov. Carrasco), at 1100–2650 m.

The new species is a member of section *Xialophyllium* Schott, and is characterized by its generally terrestrial habit; cataphylls persistent, intact only at upper nodes; frequently long, narrow leaf blades; and purple-violet spadix. It is also characterized by having blades that dry dark green with the primary lateral veins and the collective veins deeply sunken in "valleys" on drying. The species tends to have proportionately broader leaf blades at higher elevations (2400–2650 m).

The new species is perhaps most easily confused with *A. mindense* Sodiro, of Ecuador and northern Peru, but the latter differs in having longer and proportionately more slender internodes and generally proportionately broader leaf blades. *Anthurium ottobuchtienii* is also similar to *A. microspadix* Schott, but that species has proportionately wider blades (less than 6 times longer than wide) that dry green rather than brown and has a green rather than purple spadix.

A few collections have leaf blades that are shorter than normal, ranging between 2.9 and 3.5 times longer than wide. These also appear to belong here, but they are at the extreme in terms of size and shape and differ from typical *A. ottobuchtienii* in the color and venation of the dried leaf blades.

The species is named in honor of Otto Buchtien, a German who made many collections in Bolivia during the early 20th century and who made the first collection of the species.

Paratypes. BOLIVIA. Prov. Unknown: Cordillera Real, Nequejahuira, *I. Tate 633* (MO, NY). **Cochabamba:** Carrasco, Cochabamba–Villa Tunari on old rd., km 118, *Kessler et al. 7100* (LPB, MO), km 130, *B. Kessler et al. 7153* (LPB, MO). **La Paz:** Murillo, Valle de Zongo, *T. B. Croat 51426* (LPB, MO); 32.8 km beyond the summit, 300 m S of Planta Hidroeléctrica Chururaqui, *Solomon et al. 19062* (LPB, MO); 30.5 km N [below] dam at Lago Zongo, trail up Río Jachcha Cruz, *J. Solomon 9098* (LPB, MO); 44 kms después del abra de Zongo, *S. Beck 7245* (LPB); Nor Yungas, Polo-polo hacia Coroico, *O. Buchtien 3667* (NY, US); 9.5 km NE below Chuspipata, 20.2 km S of Yolosa, *Solomon 8103* (COL, LPB, MO); Serranía de Bella Vista, 16 km N of Carrasco, 37 km N of Caranavi on rd. to Palos Blancos, *Solomon & Nee 12716* (MO); Unduavi–Caranavi, 34.8 km E of Unduavi, 16.3 km SW of Yolosa, *Croat 51575* (MO); Cotapata NP, Est. Biol., Tunquini, vic. of Chairo, NW of Coroico, 23 km W of Yolosa, *Croat et al. 84754* (LPB, MO, W); Senda del Pajonal, *Bach 973* (LPB, MO), *E. Garcia et al. 4434* (LPB, MO); trail to Campo de Don Pedro, trail to the mine, *Bach 443* (LPB, MO); trail to Hornundi, *Palabral et al. 4* (LPB), *Palabral et al. 46* (LPB); Sacramento, Chuspipata–Yolosa, *A. Gentry & Solomon 52045* (F, GH, LPB, MO); 8 km de Chuspipata hacia Coroico, *M. Kessler et al. 12049* (LPB, MO); Serranía Bella Vista, Rurrenabaque–Caranavi, 28.4 km SW of middle of bridge over Río Beni near Sapecho, 21.4 km SW of Río Piquendo, *Croat et al. 84733* (LPB, MO); Caranavi hacia Sapecho, km 37, *Kessler et al. 11349* (LBP, MO); Hacienda Simaco sobre el camino a Tipuani, *Buchtien 5345* (GH, NY); Casaniacamino a Tipuani, *Buchtien 7172* (US).

Anthurium stephanii Croat & Acebey, sp. nov. TYPE: Bolivia. La Paz: Nor Yungas, Est. Biol. Tunquini, 16°12′S, 67°51′W, 1700 m, 3 Apr. 2000, *T. Kroemer & A. Acebey 994* (holotype, MO-5650250; isotypes, B, F, K, LPB, NY, US, USM, VEN). Figure 3C.

Planta hemiepiphytica; internodia brevia, minus quam 1 cm in sicco; cataphylla 5–10 cm longa, persistentia; petiolus teres, 16.5–24 cm longus; lamina oblongo-lanceolata vel oblanceolata, 28–38.5 cm longa, 7.2–9.1 cm lata; nervis primariis lateralibus 13–15 utroque; pedunculus 20 cm longus; spatha lanceolata, viridis, 7.5–12 cm longa, 9–12 mm lata, spadix 10.3–12 cm longus, 3 mm diam. in sicco, stipitatus 6 mm.

Hemiepiphytic vine; *internodes* very short near the apex, drying less than 1 cm diam., dark reddish brown; *cataphylls* 5–10 cm long, slender, persistent along with the petiole bases. *Petioles* terete, 16.5–24 cm long, sheathed 35%–40% their length, drying dark yellow-brown; geniculum 1.5–2.0 cm long, darker, terete. Leaf blades oblong-lanceolate to oblanceolate, 28–38.5 × 7.2–9.1 cm wide, 3.8–4.6 times longer than wide, broadest at middle or above middle, narrowly acuminate at apex, acute at base, semiglossy on both surfaces, dark green above,

slightly paler below, drying medium to dark green above, reddish brown to yellow-brown above, narrowly raised and concolorous to weakly paler above, drying ± acute toward the middle of the blade above, narrowly convex and darker than surface below; *primary lateral veins* 13 to 15 pairs, weak and scarcely visible on both surfaces; collective veins arising from the base, 7–10 mm from margin, scarcely raised and concolorous on upper surface, weakly raised on lower surface, weakly loop-connecting the primary lateral veins; tertiary veins obscure. INFLORESCENCE erect-spreading; *peduncle* 20 cm long, drying 2 mm diam.; *spathe* lanceolate, green, 7.5–12 × 9–12 mm; *spadix* 10.3–12 cm long, drying 3 mm diam., stipitate 6 mm. Flowers 2.3–3.7 mm long, 3 flowers visible per spiral; lateral tepals 1.7 mm wide, inner margin rounded, outer margin 2-sided. *Berries* unknown.

Distribution and habitat. *Anthurium stephanii* is endemic to Bolivia in La Paz Department at 1900–2400 m elevation.

The new species is an unusual member of *Anthurium* sect. *Calomystrium* Croat, characterized by its slender stems, persistent, lanceolate, intact cataphylls, and lanceolate dark-brown-drying blades.

This species is different from its close congeners because there are no other species of section *Calomystrium* with lanceolate leaf blades.

The species is named in honor of Stephan G. Beck, noted German botanist who has spent most of his professional career, from the 1980s to the present, in Bolivia.

Paratypes. BOLIVIA. **La Paz:** Franz Tamayo, Madidi NP, Piñalito, 30 km E of Apolo on trail to San José de Uchupiamonas, *Fuentes et al. 4688* (LPB, MO, US); Nor Yungas, Est. Biol. Tunquini, trail to Campo Don Pedro, *E. García et al. 4388* (LPB, MO), *Bach et al. 968* (LPB, MO), *Quintana et al. 8* (LPB, MO); Sud Yungas, Huancané, 7.5 km to the S over a new rd., *S. G. Beck 3109* (LPB).

Anthurium yungasense Croat & Acebey, sp. nov. TYPE: Bolivia. La Paz: Nor Yungas, Anmi Cotapata NP, Est. Biol. Tunquini, NW of Coroico, NNE of La Paz, vic. of El Chairo, 23 km W of Yolosa, 16°12′S, 67°50′W, 1300–1500 m, 21 Aug. 2000, *T. B. Croat, A. Acebey & T. Kroemer 84782* (holotype, MO-5185105; isotypes, B, COL, GOET, K, LPB, NY, QCNE, UB, US, USM, VEN). Figures 3D, 4A.

Planta terrestris; cataphylla 10–16 cm longa, plerumque intacta; petiolus 51–56 cm longus, subteres, leniter complanatus; lamina anguste ovata, 49–60(65) cm longa, 23–29(35) cm lata, profunde sagittata; lobi postici (11)13–16(18) cm longi, (8)10–10.5(12.5) cm lati; nervis basalibus 7–10 utroque; nervis lateralibus 4–6(7) utroque; pedunculus 32–38 cm longus; spatha 6.5–13 cm longa, 8–15 mm diam.; spadix atroviridis vel olivaceus, stipitatus 4–6 mm, 6.5–13.5 cm longus, 12 mm diam.

Terrestrial to ca. 1 m tall; *internodes* short or longer than broad, 1–6 × (1.5)2.0–2.7(4.5) cm, gray-green and ± scurfy; *cataphylls* 10–16 cm long, turning brown, intact or often merely as pale fibers toward the base of the cataphylls at upper nodes, these thin and appressed to the stem. *Petioles* 51–56 cm long, subterete to oval in cross section, obtusely flattened adaxially, medium green, semiglossy, unmarked or sometimes short-lineate; geniculum 2.5 cm × 7 mm, slightly thicker than petioles. Leaf *blades* narrowly ovate, 49–60(65) cm long, 23–29(35) cm wide, 1.7–2.1 times longer than wide, 1.0–1.2 times longer than petioles, subcoriaceous, dark green and matte-subvelvety, sometimes faintly pale-speckled above, slightly to moderately paler and matte below, drying matte, gray-green above, moderately paler and yellowish green below, deeply sagittate-lobed at base, briefly short-acuminate at apex; posterior lobes (11)13–16(18) cm long, (8)10–10.5(12.5) cm wide, directed downward and curved inward; anterior lobes (21)40–42(65) cm long, usually broadly rounded along margins, sometimes almost straight, rarely weakly concave; sinus hippocrepiform to obovate (sometimes closed), 10–12(16) cm deep, 3–5.5(8) cm wide; basal veins 7 to 10 pairs, 1st pair free to the base, 2nd pair almost free, 5th and higher order pairs coalesced 5–5.5 cm; posterior rib naked 2–4.5 cm along the sinus; *midrib* acutely triangular to narrowly convex (more acute toward the apex), and slightly paler to concolorous, slightly paler to moderately paler and densely pale-speckled above, narrowly rounded to bluntly acute and paler to moderately paler below, drying yellow-brown to dark brown below; *primary lateral veins* 4 to 6(7) pairs, scarcely more conspicuous than the interprimary veins, arising at 40°–65° angle, narrowly raised and bluntly acute, slightly paler to concolorous above, narrowly raised and acute to bluntly acute, slightly paler below, usually drying yellow-brown and darker than surface or yellowish and paler than surface below, arching prominently upward along the margin but often not forming a collective vein throughout most of the length of the blade; often with the lowermost pair of lateral veins smaller than primary laterals, forming well above the petiole and spreading at a broad angle to merge with the uppermost (1st) basal vein; collective veins lacking or arising from one of the uppermost primary lateral veins. INFLORESCENCE erect; *peduncles* 32–38 cm long (to 49 cm long in fruit), terete, semiglossy, medium to dark green; *spathe* 6.5–13 cm × 8–15 mm, reflexed-spreading,

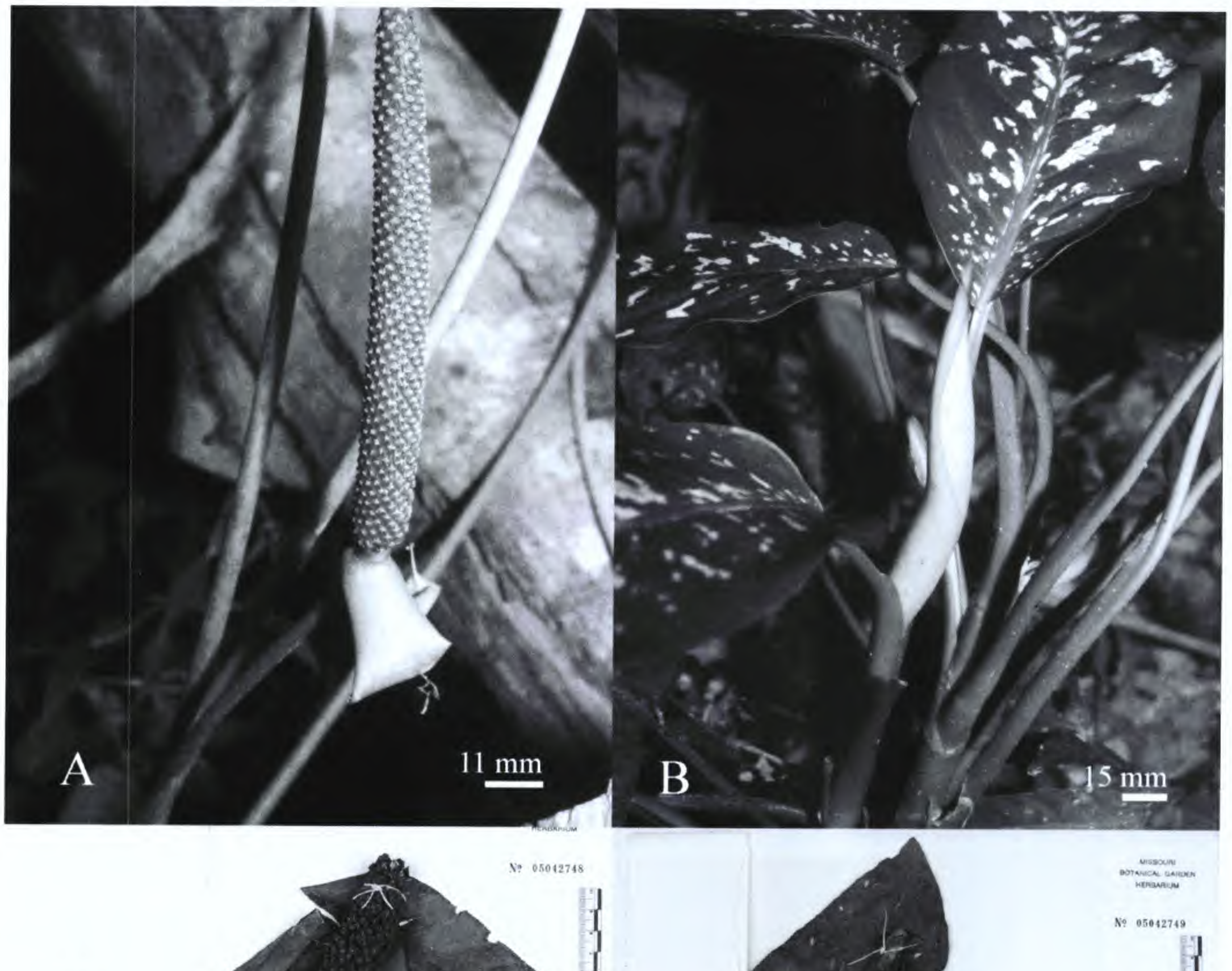

Figure 4. —A. *Anthurium yungasense* Croat & Acebey (*Croat & Acebey 84264*). Close-up of inflorescence. —B. *Dieffenbachia williamsii* Croat (*Croat et al. 84385*). Side view of whole plant showing stem, leaf, and inflorescence. C, D. *Monstera kessleri* Croat (*Kessler 8479*). —C. Type specimen with adult leaves, sheet 1. —D. Type specimen with pre-adult leaves, sheet 2.

under-rolled and sharply folded under twice, caudate-acuminate at apex, the margins rolled under; *spadix* dark green to olive-green, matte, stipitate 4–6 mm (6 mm diam.), 6.5–13.5 cm long, 12 mm diam. at base, 11 mm diam. midway, 8 mm diam. 1 cm from apex (drying 4–6 mm diam.). Flowers 1.9–2.0 mm long, 2.0–2.2 mm wide, 7 to 9 visible per spiral; tepals 1–1.6 mm wide, broadly rounded to almost straight on the inner margin, 2-sided on inside margin; stamens 0.4 mm long, 0.5 mm wide; pollen pale yellow. INFRUCTESCENCE to 16–36 cm long, 2 cm diam.; *berries* purple toward apex, white below middle.

Distribution and habitat. *Anthurium yungasense* is endemic to Bolivia, where it is known principally from Nor and Sud Yungas (hence the name). It is also known from the provinces of Caranavi, Murillo, Muñecas, and Saavedra in La Paz Department and Chapare Province in Cochabamba Department, at 1200–1700 m elevation.

The new species is characterized by its longer than wide internodes, cataphylls persistent intact or fibrous, subterete petioles, and narrowly ovate, matte-subvelvety, usually grayish-drying leaf blades with mostly free-ending primary lateral veins. Also characteristic is the stipitate, green spadix.

The new species is a member of *Anthurium* sect. *Cardiolonchium* Schott and is most easily confused with *A. incurvatum*, which has leaf blades of similar size and shape and a stipitate spadix. The latter species differs in having proportionally shorter and broader internodes, blades that are semiglossy, not matte-subvelvety above, typically drying yellow-green, and flowering spadices that are purple to purple-violet, not green. Though dried specimens of the two species are more difficult to separate, careful observation at high magnification shows the upper leaf blade surface of *A. incurvatum* appearing minutely granular, whereas that of *A. yungasense* is alveolate with the center of each epidermal cell usually sunken.

Paratypes. BOLIVIA. **Cochabamba:** Chapare, Cochabamba–Villa Tunari, *Croat 51258* (LPB, MO); vic. Hotel Caballeros, km 94, *Croat 51368* (LPB, MO). **La Paz:** Caranavi, Serranía Bella Vista, Caranavi–Sapecho, 44 km from Caranavi, *Kessler et al. 11580* (LPB, MO); Cultural Unidos, 36 km de Caranavi hacia Sapecho, *Kessler et al. 11684* (LPB, MO); Murillo, Valle de Zongo, 13.2 km above the Kahua Power Plant, *Croat 51444* (LPB, MO); 45.5 km below the dam at Lago Zongo, vic. of Cahua hydroelectric plant, *Solomon 12955* (MO); Muñecas, Río San Cristóbal near Consata, *Besse et al. 592* (SEL); Nor Yungas, *Bach et al. 1174* (LPB, MO); Cotapata NP, *Kroemer & Acebey 980* (LPB, MO); 4.6 km below Yolosa, then 19.1 km on rd. up Río Huarinilla, *Solomon 8803* (LPB, MO); 8.7 km below Chuspipata on rd. to Yolosa, *Solomon 9308* (LPB, MO); 13.7 km on rd. up Río Huarinilla, *Solomon 9417* (LPB, MO); Coroico–Yolosa, 10 km up Río San Juan, *Beck 7553* (LPB, MO); Serranía Bella Vista, Caranavi–Yucumo, 34.3 km NE of Caranavi, *Croat et al. 84264* (LPB, MO); Unduavi–Caranavi, 34.8 km E of Unduavi, 16.3 km SW of Yolosa, *Croat 51572* (LPB, MO); Sur Yungas, *Beck 24880* (LPB, MO); 7–9.5 km NE of (above) Huancané, *Luteyn & Dorr 13741* (NY), *Beck 3056* (LPB, MO), *Beck 3123* (LPB, MO); Saavedra, Charazani–Apolo, km 15, *Kessler et al. 10459* (LPB, MO); Cerro Asunta Pata, entre Apolo y Charazani, *Kessler et al. 10204* (LPB, MO).

DIEFFENBACHIA

Dieffenbachia williamsii Croat, sp. nov. TYPE: Bolivia. La Paz: Abel Iturralde, Tumupasa–San José Uchupiamonas, NW of Tumupasa, along slope leading up to Madidi NP, 5.5–5.8 km above jct. to San José near Tumupasa, 15°45′S, 67°50′W, 830–850 m, 9 Aug. 2000, *T. B. Croat, A. Acebey & T. Kroemer 84385* (holotype, MO-5187105; isotypes, B, K, LPB, MO, US). Figure 4B.

Planta 30–90 cm alta; internodia 2–3 cm longa, 1.5–1.7 cm diam.; petiolus 11–17 cm longus; lamina ovata vel ovato-elliptica, 12–20(26) cm longa, 4.5–10(13) cm lata; nervis primariis lateralibus 7–11 utroque; pedunculus 4–6.5 cm longus, 6 × 4.5 mm latus; spatha 11–16 cm longa, 1–1.7 cm lata; spadix 9.5–11.5 cm longus; pars feminea 5.8–7 cm longa, pars masculina contingens.

Small herb, 30–90 cm tall; *internodes* 2–3 cm long, 1.5–1.7 cm diam., semiglossy to weakly glossy, drying matte, usually yellowish green, sometimes medium to dark orange-brown. *Petioles* 11–17 cm long, sheathed 0.3–0.6 their length, medium green, semiglossy, smooth, drying matte, medium yellow-green; sheath acute to narrowly rounded at apex; free part sharply and broadly sulcate, drying narrowly sulcate. Leaf *blades* narrowly ovate to ovate-elliptic, 12–20(26) × 4.5–10(13) cm, (1.6)2.0–3.0(3.6) times longer than wide, 1.2 times longer than petioles, weakly inequilateral, one side 5–13 mm wider, inequilateral at base, gradually acuminate at apex, one side acute to obtuse, the other rounded or subcordate, dark green and weakly glossy above, moderately paler and matte below; *midrib* flattened-convex and concolorous above, narrowly rounded and slightly paler below, drying slightly raised and concolorous to slightly darker, often orange-brown below; *primary lateral veins* 7 to 11 pairs, arising at 40°–50° near apex, 50°–60° near base, weakly quilted-sunken above, weakly convex-pleated below, drying only weakly visible above, slightly raised and darker than surface below; minor veins few, moderately obscure. INFLORESCENCE 1 per axil; *peduncle* 4–6.5 cm × 6–

4.5 mm at midpoint, pale green, glossy; *spathe* 11–16 × 1–1.7 cm, pale yellow-green, matte outside, slightly paler and glossy inside; *spadix* 9.5–11.5 cm long, the pistillate portion 5.8–7 cm × 9 mm at base, 6 mm diam. at 1 cm from apex, contiguous with the staminate portion; pistils 38 to 41, sparsely arranged with no more than 3 across the axis; staminodia 3 to 4, not fused at base.

Distribution and habitat. *Dieffenbachia williamsii* ranges from Peru (Loreto) to Bolivia at 200–1300 m elevation. In Bolivia it is known from the departments of Beni (Ballivián, Yacuma), Cochabamba (Carrasco, Chapare), La Paz (Iturralde, Franz Tamayo, Nor Yungas), and Santa Cruz (Ichilo).

Dieffenbachia williamsii is characterized by its small, mostly yellow-green-drying, ovate to ovate-elliptic blades, petioles that dry sharply sulcate, and especially by the spadix, which lacks a sterile area between the staminate and pistillate portions.

The first collection of the species was made by R. S. Williams on 28 November 1901 at San Buenaventura in La Paz (across the river from Rurrenabaque), and the species is named in his honor.

Paratypes. PERU. **Loreto:** Coronel Portillo, Arboretum von Humboldt, Carretera Federico Basadra, km 99, *Diaz et al. 685* (MO). BOLIVIA. **Beni:** Ballivián, 12 km by lumber trail, SW of km 12 on Yucumo–Rurrenabaque Rd., *Kessler et al. 10795* (LPB, MO); Yucumo–Rurrenabaque, Escuela Técnica Agropecuaria Río Colorado, 35 km N of Yucumo, *Killeen et al. 2881* (LPB); Ballivián and Yacuma, Est. Biol. Beni, Cerro Ocho, *Guareco 85* (LPB, MO); Yacuma, Chiman 8, *Acebey 48* (LPB, MO). **Cochabamba:** Chapare, Carrasco NP, Cavernas de Repechón, *Kessler et al. 8315* (LPB, MO); Par. Machia, 1 km E of Villa Tunari, *Kessler et al. 8472* (LPB, MO); 1.5 km SE of El Palmar on rd. to Avispas, *Kessler et al. 8184* (LPB, MO); El Palmar, km 155 on old Cochabamba–Villa Tunari Rd., *Kessler et al. 8118* (LPB, MO); km 159, *Kessler et al. 8224* (LPB, MO); Carrasco NP, Cavernas del Repechón, *Kessler 8253* (LPB, MO), *8290* (LPB, MO); S of Campamento Ichoa, *Acebey 563* (LPB, MO), *580* (LPB, MO); km 143 on old rd. from Cochabamba to Villa Tunari, *Kessler 7567* (LPB, MO); km 149 on old rd. from Cochabamba to Villa Tunari, *Kessler et al. 7995* (LPB). **La Paz:** Caranavi, Serranía Bella Vista, Caranavi–Sapecho, km 42, *Kessler et al. 11516* (LPB); Iturralde, Río San Antonio, 46 km de Ixjamas a Alto Madidi, *Kessler et al. 11128* (LPB, MO); San Buenaventura, *R. S. Williams 533* (K); Nor Yungas, Polo-Polo bei Coroico, *Buchtien 3657* (US); 4.5 km below Yolosa, then 10 km W on rd. up Río Huarinilla, *Solomon 8562* (LPB, MO); Franz Tamayo, Madidi NP, Refugio Chalalán, vic. Campamento Estabon, *Kroemer & Acebey 1111* (LPB), *1134* (LPB, MO); 42 km W and 1 km N of Rurrenabaque, *Helme 423* (LPB); Sud Yungas, 5 km de Chamaca a La Asunta, *Kessler et al. 5803* (LPB, MO). **Santa Cruz:** Ichilo, 3 km by river above Campamento Macuñucu, *Kessler et al. 8700* (LPB, MO).

MONSTERA

Monstera kessleri Croat, sp. nov. TYPE: Bolivia. Cochabamba: Chapare, Parque Machia, 1 km E of Villa Tunari, 16°48′S, 65°24′W, 350 m, 14 Sep. 1996, *T. Kessler 8479* (holotype, MO-05042748; isotype, LPB). Figures 4C, D, 5A.

Planta hemiepiphytica; petiolus 15–36 cm longus, vaginatus ad geniculum; lamina anguste ovata, ovato-elliptica, 25–41(46.5) cm longa, 13–25 cm lata; pedunculus 22 cm longus, ca. 5 mm diam. in sicco; spadix 11.5 cm longus, 2.5 cm diam.

Hemiepiphyte; stems with pre-adult *internodes* 1–2 cm long, drying smooth, dark yellow-brown, densely and minutely granular on magnification; adult internodes unknown. *Petioles* 15–36 cm long, sheathed throughout to geniculum, drying matte, medium-dark yellow-brown, weakly and closely ridged; sheath margin narrow, sometimes flaking free. Leaf *blades* narrowly ovate to ovate-elliptic, 25–41(46.5) × 13–25 cm, (1.2)1.6–1.9(2.7) times longer than wide, 1.1–1.7 times longer than petioles, rounded to acute at apex, acute to weakly attenuated or rounded at base, drying dark brown and matte above, dark yellow-brown and semiglossy below; margins entire and with a single elongated perforation or with only 1 to 2 deep, narrow sinuses open to the margin (only 1 deep sinus on pre-adult blades); *midrib* drying weakly raised and concolorous above, convex and slightly paler below; *primary lateral veins* 9 to 11 pairs, arising at an acute angle then spreading at 30°–50° angle, flat and weakly visible above, convex and slightly darker than surface below; minor veins weak, fine, parallel. INFLORESCENCES with *peduncle* 22 cm long, ca. 5 mm wide on drying, drying dark yellow-brown; *spadix* 11.5 cm long, 2.5 cm diam. Styles 3–4.5 mm diam. on drying, irregularly angular, matte, concave; stigma raised, oblong, 1.8–2.2 mm long, 0.3–0.4 mm wide, the margins light brown, with a deep medial furrow.

Distribution and habitat. *Monstera kessleri* is known only from the type, collected near Villa Tunari in Cochabamba, Bolivia, but juvenile material collected near Rurrenabaque and an aberrant specimen from Peru (see below) almost certainly belong to this species, too.

The new species is characterized by its narrowly ovate, dark brown-drying leaf blades with only 1 to 2 deep sinuses per side. They are similar in size, shape, and color to those of *Monstera spruceana* (Schott) Engler, which also has similar pre-adult blades, but differs in having the peduncle shorter than the spadix (vs. about twice as long in *M. kessleri*). A collection from the department of La Paz,

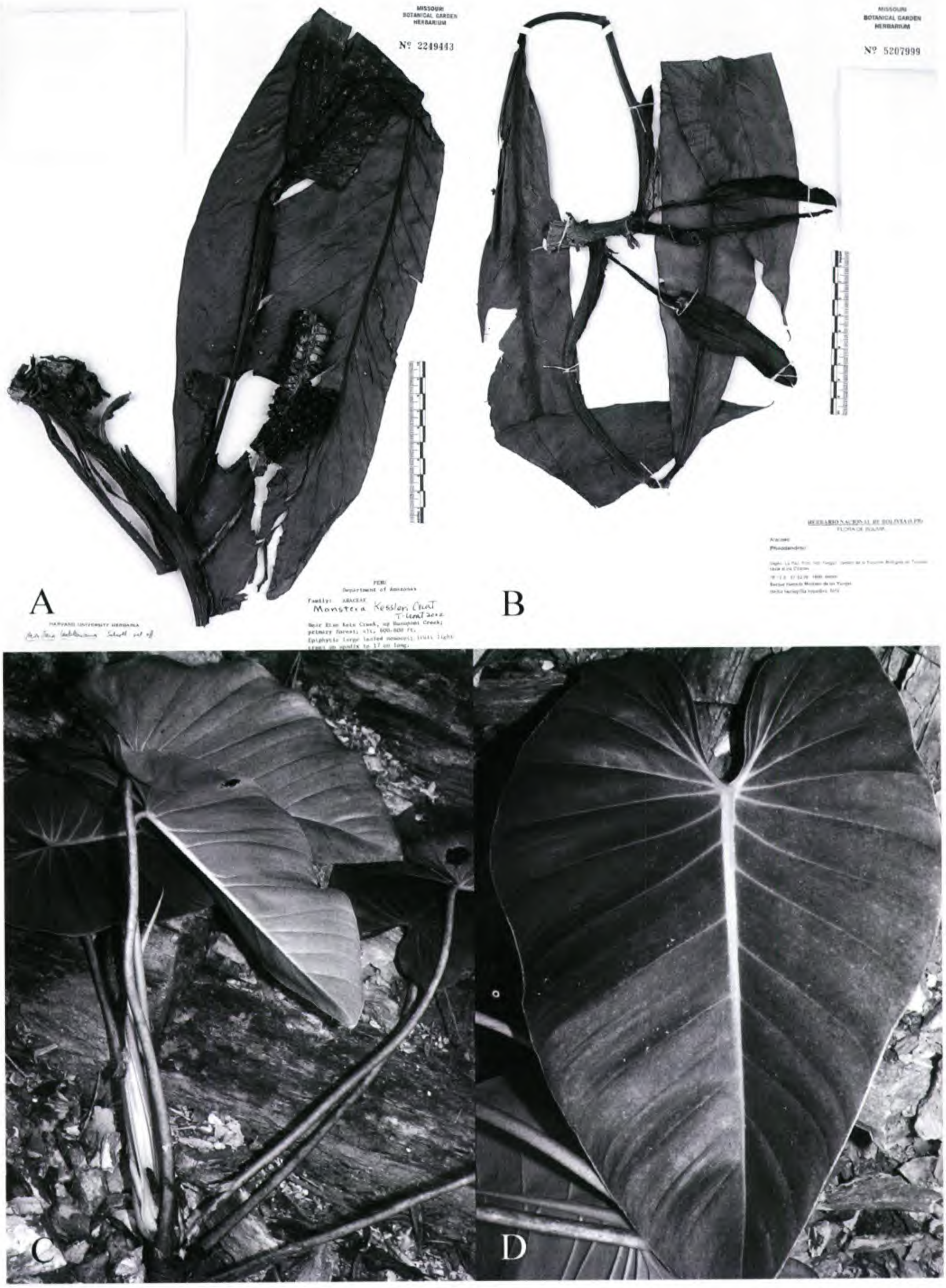

Figure 5. —A. *Monstera kessleri* Croat (*Kessler 8479*). Adult plant with blade lacking perforations [hole in leaf is an artifact of collecting]. —B. *Philodendron cotapatense* Croat & Acebey (*Kroemer & Acebey 1558*). Type specimen. C, D. *Philodendron kroemeri* Croat & Acebey (*Croat & Acebey 84820*). —C. Habit. —D. Close-up of adaxial surface of blade.

Province Franz Tamayo (*Helme 252*), collected 42 km west and 1 km north of Rurrenabaque at 14°25′S, 67°55′W, 330 m, is very likely a juvenile plant of *M. kessleri*, and it has exserted leaves rather than the shingle-leaves characteristic of *M. spruceana*.

The species is named in honor of Michael Kessler, a German plant ecologist from the University of Göttingen who has devoted much of his professional career to the plants of Bolivia. Kessler has collected many interesting and new Araceae during the course of his studies and made an extensive study of the Araceae in Bolivia (Kessler & Croat, 1999).

Philodendron

Philodendron cotapatense Croat & Acebey, sp. nov. TYPE: Bolivia. La Paz: Nor Yungas, Cotapata NP, trail to Est. Biol. Tunquini, toward Río Cedroni, 16°12′S, 67°52′W, 1800 m, 12 Sep. 2000, *T. Kroemer & A. Acebey 1558* (holotype, MO-5207999; isotype, LPB). Figure 5B.

Planta hemiepiphytica; internodia 1–3 cm longa, 1.7 cm diam.; cataphylla 8 cm longa, acute 1-costata, decidua; lamina oblonga, 41.5–43 cm longa, 6–6.7 cm lata, anguste acuta ad basim; nervis primariis non manifestis; inflorescentiae 2 in quaque axilla; pedunculus 4–6 cm longus; spatha 8.5–9.5 cm longa.

Appressed-climbing hemiepiphyte; *internodes* 1–3 cm long, 1.7 cm diam., drying initially blackish and smooth, becoming minutely, finely and irregularly ridged, matte, finally light yellow-brown and smooth with big folds, sometimes with the epidermis loosening; *cataphylls* 8 cm long, sharply 1-ribbed on drying, drying blackened, deciduous. Leaf *blades* oblong, 41.5–43 × 6–6.7 cm, 6.9 times longer than wide, 2–2.3 times longer than petioles, narrowly acute at base, narrowly caudate-acuminate at apex, semiglossy, slightly bicolored, drying medium gray-green above, slightly paler and yellowish gray-green below; *midrib* broadly convex and slightly darker than surface above, narrowly convex and darker than surface below, drying finely and inconspicuously ridged on both surfaces; *primary lateral veins* not at all apparent; minor veins numerous, fine, arising at 35°–45° angle, sometimes drying weakly undulate. INFLORESCENCES 2 per axil; *peduncle* 4–6 cm long, drying black, 3 mm diam. midway; *spathe* 8.5–9.5 cm long, drying 1.2–1.5 cm diam.; stipe 4 mm long in front, 5 mm wide; *spadix* 8.7 cm long, ca. 0.8 mm shorter than the spathe; pistillate portion of spadix 2.1 cm long, drying 7 × 3 mm wide; staminate portion of spadix 6.5 cm long, drying 5 × 8 mm wide. Pistils 0.8–1.0 mm long; 5- to 6-locular; stigmas 0.6–0.8 mm diam.; ovules 1 per locule, basal 0.6–0.7 mm long; enveloped in a gelatinous envelope 2 mm long; funicle ca. 2 times as long as ovule.

Distribution and habitat. *Philodendron cotapatense* is endemic to Bolivia, where it is known only from the type locality in Parque Nacional Cotapata (hence the name), in La Paz Department, at 1800 m elevation.

The species is a member of section *Calostigma* (Schott) Pfeiffer, subsection *Glossophyllum* (Schott) Engler, series *Glossophyllum* (Schott) Croat. It is characterized by its somewhat grayish drying, narrowly oblong-oblanceolate blades that lack any obvious primary lateral veins and its moderately small, narrowly pedunculate, blackish drying inflorescences. It is closest to *P. paxianum* K. Krause, which differs in having leaf blades with distinct primary lateral veins.

An apparently juvenile collection (*Solomon 9549*) has blades with similar venation, but leaves that dry light yellow-green. It is uncertain if that collection belongs here or if it represents another species.

Paratype. BOLIVIA. **La Paz:** Nor Yungas, Est. Biol. Tunquini, Hornuni Bajo, senda del campo Dn. Pedro al pajonal detrás del río Cedroni, *Bach et al. 1717* (LPB, MO).

Philodendron kroemeri Croat, sp. nov. TYPE: Bolivia. La Paz: Nor Yungas, Serranía Bella Vista, Caranavi–Yucumo, 34.3 km NE of Caranavi, 15°41′30″S, 67°29′37″W, 1567 m, 5 Aug. 2000, *T. B. Croat, A. Acebey & T. Kroemer 84820* (holotype, MO-5185172–3; isotypes, B, F, GOET, K, LPB, NY, US, USC, USM). Figures 5C, D, 6A.

Planta hemiepiphytica; internodia brevia, 3 cm diam.; cataphylla 22 cm longa, acute 2-costata, persistentia intacta; petiolus 43 cm longus, subteres; lamina late ovata, 42.5 cm longa, 28.5 cm lata, profunde lobata ad basim; lobi postici 12.5–14 cm longi, 10 cm lati; nervis basalibus 6–7 utroque; nervis primariis lateralibus 6 utroque; inflorescentiae 3–7 in quaque axilla; pedunculus (1.5)4–7.7 cm longus; spatha 4.5–5.5 cm longa; spadix 4.8–5.2 cm longus; pars masculina 1.2–2.1 cm longa, 6 mm diam.; pars feminea 3.0 cm longa, 6.5–7 mm diam.; ovarium 4–5 loculare; ovula 1 in quoque loculo.

Appressed-climbing hemiepiphtye; *internodes* short, 5–6 cm long, to 3 cm diam., drying dark yellow-brown, narrowly ridged longitudinally; *cataphylls* 22 cm long, sharply 2-costate, medium green, obscurely darker green-lineate, marcescent and persistent semi-intact at least at the upper

Figure 6. —A. *Philodendron kroemeri* Croat & Acebey (*Croat & Acebey 84820*). Close-up of stem, petiole bases, and inflorescences. B, C. *Rhodospatha mukuntakia* Croat (*Croat et al. 84386*). —B. Habit. —C. Close-up of petioles with fibrous sheath and an unopened inflorescence. —D. *Stenospermation killipii* Croat & A. Gomez (*Plowman & Schunke 7402*). Potted plant showing erect habit with somewhat cernuous inflorescence.

nodes, drying light yellowish brown, soon deciduous. *Petioles* 43 cm long, subterete, medium dark green and semiglossy, obtusely flattened adaxially, unmarked, drying dark brown to blackened, 8–10 cm diam., matte. Leaf *blades* broadly ovate, 42.5 cm long, 28.5 cm wide, 1.5 times longer than wide, subcoriaceous, dark green and weakly glossy to semiglossy above, slightly paler and semiglossy below, abruptly short-acuminate at apex, deeply lobed at base, drying dark blackish brown above, slightly paler and dark yellow-brown below; anterior lobe 32.5 cm long, the margins broadly convex; posterior lobes 12.5–14 cm long, 10 cm wide; basal veins 6 to 7 pairs, the 1st pair free or nearly so to base, 3rd and higher order basal veins coalesced 1.5–4 cm; posterior rib scarcely naked, mostly to ca. 1 cm; *midrib* broadly convex and concolorous to slightly paler above, convex to narrowly rounded and slightly paler below, drying slightly darker than surface above, moderately darker and irregularly and finely striate below; *primary lateral veins* 6 pairs, arising at 55° angle near apex, to 65°–85° angle in lower half of blade, convex, darker than surface, sometimes drying blackened and much darker than surface; minor veins moderately indistinct with a few visible, drying close and fine but not markedly visible. INFLORESCENCES 3 to 7 per axil; *peduncle* (1.5)4–7.7 cm long, 9 mm diam., pale green at base, darker green toward apex, dark brown to blackened on drying; *spathe* white at anthesis, becoming pale green, greenish white and glossy inside, 4.5–5.5 cm long, 6–9 mm diam., abruptly pointed at apex, drying blackened to dark brown; *spadix* 4.8–5.2 cm long; staminate portion 1.2–2.1 cm long, 6 mm diam.; sterile staminate portion not obvious on live material; pistillate portion 3.0 cm long in front, 2.3–2.6 cm long in back, 6.5–7 mm diam. at base, 6.0 mm diam. at apex. Pistils bottle-shaped, subterete to rhombic in cross section, the upper 1 mm tapered inward, 1.0–1.7 mm diam.; locules 4 to 5 per ovary; ovules 1 per locule, 0.6–0.9 mm long, 0.3–0.4 mm diam.; placentation basal; funicle shorter than ovule; stigma 0.5–0.7 mm diam., 2–3 mm thick; androecium 1.0–1.7 mm diam., broadly convex at apex, subrounded to irregularly angular, 4- to 5(6)-sided, the angles broadly rounded. Fruits not known.

Distribution and habitat. *Philodendron kroemeri* is known from Bolivia at the Cotapata National Park in La Paz and Peru at Pasco Province (Oxapampa) at 1650–2400 m elevation.

The new species is characterized by its persistent, more or less intact cataphylls, terete, dark brown to black-drying petiole, broadly ovate, dark blackish brown-drying blades, and cluster of 3 to 7 inflorescences. Similar material has been collected in Peru, Department of Pasco, in the vicinity of Oxapampa at 1600–2080 m [*Vásquez et al. 26142*, *Soukup 2331* (GH); *Foster et al. 7736* (F, MO); *D. Smith 2705* (MO, USM)]. This material may prove conspecific, but differs in having deciduous cataphylls and blades that dry reddish brown on the lower surface (rather than dark yellow-brown).

The species is named in honor of German botanist Thorsten Kroemer, specialist on the bromeliads of Bolivia, who has collected many interesting and new species of Araceae during the course of investigations for his Ph.D. thesis from the University of Göttingen.

Paratypes. BOLIVIA. **La Paz:** Nor Yungas, Cotapata NP, Est. Biol. Tunquini, senda del campo de Don Pedro al camino de la mina, *García 4435* (LPB); Hornuni Bajo, near Campamento Don Pedro, *Kroemer & A. Acebey 1745* (LPB, MO), *1590* (LPB, MO); Hornuni Bajo, senda cafetal al camino de la mina, *Bach et al. 1623* (LPB, MO). PERU. **Pasco:** Oxapampa, Chontabamba, carretera camino a La Suiza antigua (km 10–13), *Lingan et al. 373* (B, K, MO, US, USM); carretera camino a La Suiza nueva, *Lingan et al. 376* (MO, USM).

Rhodospatha

Rhodospatha mukuntakia Croat, sp. nov. TYPE: Bolivia. La Paz: Abel Iturralde, Tumupasa–San José de Uchupiamonas, NW of Tumupasa, Madidi NP, 5.5–5.8 km above jct. to San José near Tumupasa, 15°45′N, 67°50′W, 830–850 m, 9 Aug. 2000, *T. B. Croat, A. Acebey & T. Kroemer 84386* (holotype, MO-5187103; isotypes, B, F, K, LPB, NY, US, USM, UB). Figure 6B, C.

Planta terrestris; internodia brevia, 2.5–3 cm diam.; petiolus 35–71 cm longus; lamina plus minusve elliptica, 37.5–63 cm longa, 18–31 cm lata; nervis primariis lateralibus 25–35 utroque; pedunculus 16–35 cm longus; spatha cremea, plus minusve elliptica; spadix 9.5–16 cm longus, 1–1.5 cm diam., stipitatus 5–18 mm, dilutus aurantiacus vel cremeus.

Terrestrial herb, 50–100 cm tall; *internodes* short, 2.5–3 cm diam., the epidermis always covered by overlapping petiole sheaths. *Petioles* 35–71 cm long (averaging 54 cm), drying light yellowish brown, closely fissured adaxially, deciduous, sheathed to within 1–9 cm of the geniculum; sheath light brown, highly weathered, with pale, ± parallel strands of fibers and sometimes with fragments of brown epidermis persisting; geniculum 1.5–4 cm long, narrowly sulcate, drying sharply sulcate, remote 2.5–3.5 cm from the blade. Leaf *blades* ± elliptic, 37.5–63 × 18–31 cm, averaging 55 × 26

cm, 0.76–1.2 times longer than petioles, broadest at the middle, slightly inequilateral (one side ca. 1 cm wider), somewhat inequilateral, acute to obtuse and attenuate at base, acute to obtuse or narrowly rounded and abruptly acuminate at apex, drying brownish green above, reddish brown beneath; *midrib* sunken and concolorous above, much thicker than broad below, drying brown, softly and densely crustose-puberulent; *primary lateral veins* 25 to 35 per side, (4)7–21 mm apart (mostly 15–20 mm) arising at an acute angle then spreading at 65°–85° angle, weakly curved to the margin, drying dark brown, smooth; interprimary vein 1, usually much weaker than the primaries; minor veins usually 2 (sometimes 3), alternating with the interprimary and primary veins, the interprimary and minor veins usually sparsely granular; cross-veins conspicuous and close, extending across the whole surface, the surface greenish and densely reddish granular punctate on magnification. INFLORESCENCE erect; *peduncle* 16–35 cm long, drying 3–5 mm diam., 0.29–0.79 times as long as the petioles, averaging about ½ as long as petioles; spathe cream, turning reddish brown on drying, somewhat elliptic, acute at apex, ca. 1.5 cm longer than the spadix; *spadix* 9.5–16 cm long, 1–1.5 cm diam., to ca. 7 mm diam. ca. 1 cm below apex, tapered slightly toward both ends, stipitate 5–18 mm, light orange to cream (variously described on labels as B & K yellow-red 8/2.5, 8/5, yellow-red 9/7.5, B & K yellow 8/2.5, and B & K yellow-red 9/10). Pistils often regularly pentagonal or 4-sided, sometimes irregularly 5- to 6-sided, 1–2 mm diam. (those at the base of the spadix often larger), frequently 2.4–3 mm diam., the sides straight to weakly convex, rarely concave; style faintly purplish brown with a frost-like matte surface; stigma 0.6–0.9 mm long, 0.3–0.4 mm wide, brown, raised, usually sulcate medially; anthers narrowly pointed toward apex, 1.8 mm long, 0.7 mm diam., promptly weathering at apex.

Distribution and habitat. *Rhodospatha mukuntakia* ranges from southern Colombia (Putumayo) to central Peru (Amazonas, Cuzco, and Madre de Dios) and Bolivia (La Paz) from 180 to 930 m. Most collections are from Nangaritza Cantón (at 930 m) in Zamora-Chinchipe, Ecuador, and the drainage of the Río Santiago in the Department of Amazonas at 180–200 m elevation in Peru.

Rhodospatha mukuntakia is recognized by its terrestrial habit, short internodes obscured by the petiole bases, reddish brown-drying petioles, ribbed adaxially and with a deciduous, highly fibrous sheath extending to within 1–9 cm of the geniculum. The geniculum also dries sharply sulcate, the blades are more or less elliptic, drying reddish brown and reddish granular-punctate on the lower surface with prominent, close cross-veins, the lower midrib densely crustose-puberulent.

The species epithet is based on the common name "mukuntak" used by the Aguaruna indigenous people of the Río Cenepa and Río Santiago drainages in northern Amazonas, Peru, one of the localities where most collections of this species have been made.

Paratypes. COLOMBIA. **Caquetá:** 10 km SW of San José de Fragua, SW of Florencia, *Davidse et al. 5704* (COL, MO). **Putumayo:** Mocoa, *Schultes & Cabrera 19045* (US); Villa Garzón, Río Gineo, 8 km W of Villa Garzón, *Plowman 2057* (F, GH). ECUADOR. **Morona-Santiago:** Pumpuentza, WNW of village, *Brandbyge & Asanza 32333* (AAU); Pumpuentza, SSW of village, *Brandbyge & Asanza 32431* (AAU); Los Tayos, *L. Rodríguez et al. 315A* (MO); Taisha, *Brandbyge & Asanza 31879* (AAU, MO); Gualaquiza, Misión Bomboiza Salesiana, *Sparre 19139* (S). **Napo:** Res. Florística "El Chuncho" Payamino, 5 km al NW de Coca, Est. Exp. INIAP-Napo, *Cerón 2407* (MO); vic. Tena, *Asplund 8897* (MO); Río Aguarico near confluence with Río Pavayacu Bravo, *Gomez 236* (MO). **Sucumbios:** Cantón Gonzalo Pizarro, Parroquia Pto. Libre (San Pedro de los Cofanes), Cofán Sinangüe, *Cerón et al. 22078* (QAP). **Zamora-Chinchipe:** Nangaritza, Cordillera del Cóndor, Shaimi, frente a destacamento militar, Río Nangaritza, *Palacios et al. 8711* (MO, QCNE); Shaime, jct. of Río Nangaritza and Río Numpatakaime, *Palacios 6611* (MO, QCNE); Nangaritza, Cordillera del Cóndor, Parroquia Guayzimi, Campamento militar Miazi, S of Río Nangaritza, *Cerón et al. 17870* (QAP). PERU. **Amazonas:** 1 km below La Poza, E of Río Santiago, *D. Peña 128* (MO); Río Cenepa, near Huampama, near Chávez Valdivia, *Kujikat 312* (MO); Bagua, La Peca, Cordillera Colán, SE of La Peca, 3rd camp, *Barbour 4143* (MO, USM); Shimpunts, chacra al lado de Shimpunts, *Ancuash 1321* (MO); vic. Kusu, Río Numpatkin, Río Cenepa drainage system, monte orilla de Chapis, *Ancuash 7410* (MO); ca. 5 km E of Chávez Valdívia, *Ancuash 1169* (MO); S of Huampami trail to house of Theodora, S of Río Cenepa, *Berlin 1665* (MO); Kusu, Río Numpatkin, vic. Kusu, *Kayap 515* (MO, US); Condorcanqui, Río Santiago, 2–3 km behind Caterpiza, *Tunqui 904* (MO); 2 km behind Caterpiza, E of Caterpiza, ca. 65 km N of Pinglo, *Huashikat 393* (MO), *2060* (MO), *2256* (MO), *2287* (MO), *2305* (MO), *2342* (MO); 1 km behind Caterpiza, E of Caterpiza, Río Santiago, *Huashikat 731* (MO), *886* (MO); Río Santiago, otra banda de Caterpiza, 2 km en trocha de metallar, *Tunqui 128* (MO). **Cuzco:** La Convención, Echarati Cashiriari, 3 well site, 5.0 km S of Camisea River, *Nuñez et al. 23980* (MO, US). **Madre de Dios:** Manunear Shintuya on rd. to Salvación, *Plowman & Davis 5076* (GH). **San Martín:** Mariscal Cáceres, Santa Cruz, *Schunke 7991* (MO). BOLIVIA. **Beni:** Ballivian, Rurrenabaque–Sapecho, 21.7 km NW of La Cascada, 38.8 km NW of Las Delicias, *Croat et al. 84666* (LPB, MO). **Cochabamba:** Chapare, vic. Villa Tunari, along Río Espíritu Santo on trail to Baja Copacabana, *Croat 51281* (LPB, MO). **La Paz:** Sud Yungas, Caranavi–Yucumo, 47.4 km NE of Yucumo, 5.1 km from border of Beni, *Croat et al. 84350* (LPB, MO).

STENOSPERMATION

Stenospermation dictyoneurum Croat & Acebey, sp. nov. TYPE: Bolivia. La Paz: Nor Yungas, Serranía Bella Vista, Caranavi–Yucumo, 37.6 km NE of Caranavi, 15°40′37″S, 67°29′34″W, 1508 m, 5 Aug. 2000, *T. B. Croat, A. Acebey & T. Kroemer 84270* (holotype, MO-5185298; isotypes, K, LPB, US). Figures 7C, D, 8A.

Planta epiphytica; internodia 1.5–2 cm longa. Petiolus (10)13–21 cm longus; lamina 13–31 cm longa, 3–5.3 cm lata; pedunculus 22–29 cm longus, 1.5–2.5 mm diam., atrobrunneus in sicco; spatha nivea; spadix niveus albus, 3.3–6.2 cm longus, 5–10 mm diam.

Epiphyte at 2–3.5 m; stems soon brown; *internodes* 1.5–2 cm long, drying 6–7 mm diam., usually drying dark brown and moderately smooth, sometimes gray and weakly glossy. *Petioles* (10)13–21 cm long, sheathed 0.43%–0.71% their length, medium green, matte, drying dark brown; sheath erect, narrowly rounded at apex, ending 2.2–11 cm below the geniculum. Leaf *blades* 13–31 × 3–5.3 cm, 3.5–6.3 times longer than wide, subcoriaceous, dark green and semiglossy above, moderately paler and glossier below, drying dark yellow-brown to grayish brown and matte above, yellowish brown to olive-green and semiglossy to weakly glossy on lower surface; *midrib* sunken and slightly paler above, thicker than broad and slightly paler below, drying weakly raised, sometimes narrowly sunken toward apex, ± concolorous above, drying narrowly raised on lower surface near the base, convex to weakly ridged and concolorous to slightly darker below; *primary lateral veins* weakly visible above, scarcely apparent below, drying weakly, narrowly and acutely raised above, much weaker and somewhat darker below, scarcely more apparent than the minor veins below; minor veins also acute and narrowly raised above with numerous wavy, acutely erect cross-veins, these sometimes appearing to be reticulate, those of the lower surface scarcely apparent; lower surface weakly and densely granular. INFLORESCENCE erect to weakly cernuous; *peduncle* 22–29 cm long, drying dark brown, 1.5–2.5 mm diam.; *spathe* white, soon brown, promptly deciduous; *spadix* directed weakly to one side, greenish white, 3.3–6.2 cm long, 5–10 mm diam., cylindroid, rounded at both ends. Flowers 4 to 5 visible per spiral, 1.0–1.4 mm long, 1.2–1.4 mm wide, truncate at apex, drying dark brown; stigma subglobose, ca. 0.5 mm wide, brush-like, raised above the surface of the stigma.

Distribution and habitat. Stenospermation dictyoneurum is known only from Bolivia in La Paz at 1300–1850 m elevation.

The new species is characterized by its generally epiphytic habit, rather short, slender internodes, petioles sheathed usually to ⅔–¾ their length, and leaf blades drying dark brown above, moderately paler and yellow-brown below, with the minor veins narrowly and acutely raised on the upper surface with distinct oblique and transverse cross-veins and sparse, short pale lineations between the minor veins.

The species epithet is based on the Greek "diction" (net) and "neuron" (nerved) alluding to the prominent net-like reticulum of its veins.

Paratypes. BOLIVIA. **La Paz:** Caranavi, Serranía Bella Vista, Caranavi–Sapecho, km 37, *Kessler et al. 11348* (LPB, MO); Nor Yungas, Est. Biol. Tunquini, *Bach 969* (LPB, MO), *Kroemer & Acebey 1556* (LPB, MO); Saavedra, Camata to Apolo, km 10, *Kessler 10323* (LPB, MO).

Stenospermation killipii Croat & A. Gomez, sp. nov. TYPE: Peru. Huánuco: Leóncio Prado, Hermilio Valdizán, La Divisora, along rd. from Pumahuasi to La Cumbre, 1600–1660 m, originally collected live by T. Plowman, cultivated at MO, 26 June 1978, *T. B. Croat 78348* (holotype, MO-05015335; isotypes, B, F, K, NY, US, USM). Figures 6D, 7A, B.

Planta terrestris vel epiphytica; internodia 0.5–4.0 cm longa, 1.2–2.0 cm diam.; petiolus 9–12.5 cm longus; lamina elliptica vel oblongo-elliptica vel obovato-elliptica, 15–24 cm longa, 3.5–6.5 cm lata, superficie dilute brevilineata; pedunculus 23–33 cm longus; spatha 8–9.5 cm longa, 2.5 cm lata, persistens, viridis vel virello-alba.

Terrestrial or epiphytic; stems clustered, (0.5)1–1.5 m tall; *internodes* 0.5–4.0 cm long, 1.2–2.0 cm diam., dark green, medium green, becoming gray-green, weakly glossy, drying dark brown, closely ridged, densely and finely granular. *Petioles* 9–12.5 cm long, sheathed from ⅔ its length or to the geniculum, matte to weakly glossy, dark olive-green; sheath decurrent, incurled but mostly open; free portion sub-terete, bluntly sulcate; geniculum 1.8 cm long, sharply sulcate, drying sharply sulcate. Leaf *blades* elliptic to oblong-elliptic or obovate-elliptic, 15–24 cm long, 3.5–6.5 cm wide, 2.5–4.6 times longer than wide, 1.5–1.6 times longer than petioles, subcoriaceous, acute at base, acuminate at apex, dark green and weakly glossy to subvelvety above, moderately paler and semiglossy to weakly glossy below, drying dark yellow-brown to yellowish green above, medium yellow-brown below; *midrib* obtusely and deeply sunken and concolorous above, slightly paler below, drying darker below, drying finely striate; *primary lateral veins* not apparent

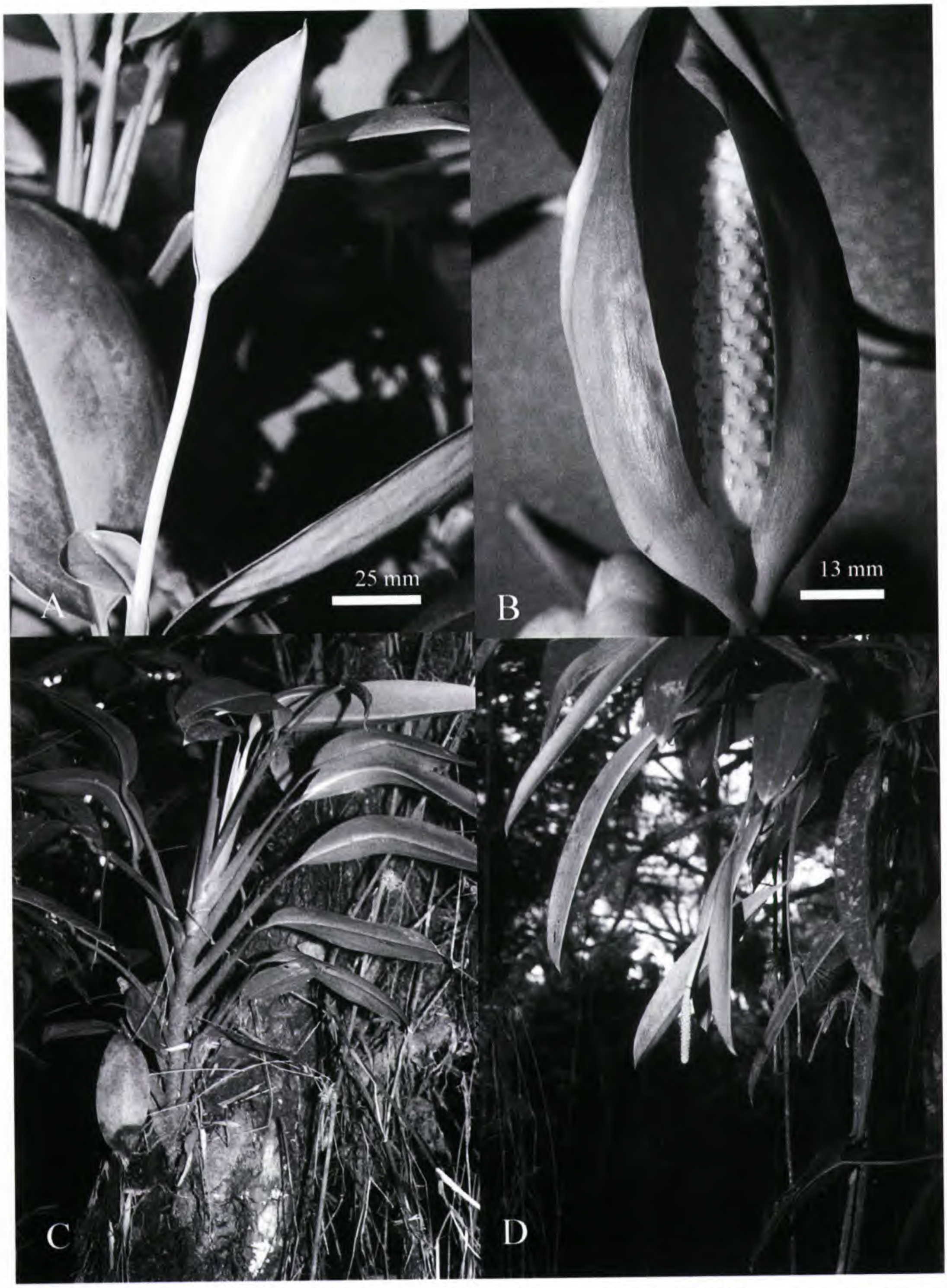

Figure 7. A, B. *Stenospermation killipii* Croat & A. Gomez (*Plowman & Schunke 7402*). —A. Erect inflorescence showing straight peduncle and elliptic spathe. —B. Close-up of inflorescence with open spathe exposing spadix. C, D. *Stenospermation dictyoneurum* Croat & Acebey (*Croat et al. 84270*). Habit.

above, weakly visible below; minor veins drying weakly raised, with numerous pale, short-pale-lineations in between the minor veins above, weakly raised but less dense below with fewer pale cellular inclusions. INFLORESCENCES erect; *peduncle* 23–33 cm long, drying dark brown 1–2 mm diam.; *spathe* 8–9.5 cm long, 2.5 cm wide at anthesis, 7.5 cm wide when flattened, green to greenish white, erect, semiglossy outside, weakly glossy inside, persisting after anthesis, dark reddish brown; *spadix* white, 4.5–7 cm long, 1–1.5 cm diam., with reduced flowers and bluntly pointed at apex. Pistils 3–3.5 mm diam., 8 to 9 visible per spiral.

Distribution and habitat. *Stenospermation killipii* ranges from Ecuador (Zamora-Chinchipe) and Peru (Amazonas), San Martín (Rioja), Huánuco (Coronel Portillo, Leoncio Prado), Junín (Oxapampa, Tarma), Ayacucho (La Mar), and Cuzco (Paucartambo) to Bolivia at (700)1600–2100 m elevation. In Bolivia it occurs in Cochabamba (Chapare) and La Paz (Sud Yungas). It may also occur in Brazil in Bahia (see below).

Stenospermation killipii is characterized by its erect, frequently terrestrial habit, long stems, often fully sheathed petioles, weakly glossy to subvelvety, dark yellow-brown to yellow-green-drying blades, and especially by its short spadix and persistent spathe.

The new species is similar to *Stenospermation wallisii* Masters in having a persistent spathe, but differs in having leaf blades that dry yellow-green to light yellow-brown and lack the dense, pale, short lineations between the minor veins.

Gentry et al. 21954, from the far north of Peru in Loreto (Maynas: Río Gueppi), is very similar to *S. killipii*, but differs in being from only 200 m elevation and in having a persistent spathe and stems drying a paler rusty brown. Since no other collection was made below 1000 m, it seems likely that this represents another species.

The new species is named after Smithsonian botanist E. P. Killip who, along with A. C. Smith, was the first (1929) to collect it in Peru. This species was described with A. Gomez, a former student of Tom Croat, who studied the *Stenospermation* of Central and South America for her master's thesis at St. Louis University in St. Louis, Missouri, U.S.A.

Paratypes. ECUADOR. **Morona-Santiago:** Sangay NP, trail to Sardina Yacu, Río Sardina-Río Volcán, *Montalvo & Cerón 11A* (GAP). **Zamora-Chinchipe:** Nangaritza Cantón, Río Nangaritza, Miazi, confluence of Río Chumbiriatza–Río Nangaritza, *Palacios & Neill 6789* (MO, QCNE). PERU. **Amazonas:** near border with San Martín, *van der Werff et al. 16690* (DUKE, MO, SEL, UB, USM); Bagua, 12 km E of La Peca, *Barbour 2630* (MO); 12–17 km E of La Peca, *Barbour 2527* (MO, USM); Chachapoyas, Rodríguez e Mendoza, Cochamal, localidad "Tinas," Montaña de Yanamonte, *Diaz et al. 4512* (MO). **Ayacucho:** Aina, Huanta–Río Apurimac, *Killip & Smith 22550* (NY, US); La Mar, below Huanhuachayo on the Capprichio–Puncu trail, Río Apurimac valley, *Madison 10255–70* (US). **Cajamarca:** San Ignacio, San José de Lourdes, base of Cerro Picorana, *Díaz et al. 10284* (MO), *10777* (K, MO, NY, UB, USM); San Ignacio, San José de Lourdes, Camaná, *Campos & Corrales 3760* (MO, QCNE, US, USM); base of Cerro Picorana, *Vásquez et al. 26729* (F, MO, USM). **Cuzco:** Paucartambo, Kosñipata Valley, km 150, San Pedro, jct. of Río Unión and Río Kosñipata, *P. Nuñez 11992* (MO). **Huánuco:** Coronel Portillo, Padre Abad, La Divisora, near Río Chino, *Schunke 9275* (MO); Leoncio Prado, Hermillo Valdizán, La Divisora, Pumahuasi–La Cumbre, *Plowman & Schunke 7402* (SEL); 2.8 km N of divide, *Croat & Sizemore 81716* (MO, USM); Cordillera Azul, on rt. 16, near border with Ucayali Department, 38 km N of Tingo María, *Davidson & Jones 3457* (LAM); 39.2 km E of Tingo María on rd. to Pucalpa, *Davidson & Jones 9338* (LAM, MO); Tingo María–Pucalpa, "La Divisora," 3.8 km N of Ucayali border, *Croat & Sizemore 81694* (MO, USM); Tingo María–Huayna Capac, 10.0 km W of Río Huallaga, *Croat & Sizemore 81865* (MO, USM). **Junín:** Chanchamayo Valley, *Schunke 475* (F); Tarma, La Merced–Satipo, ca. 5 km E of La Merced along Río Chanchamayo, *Croat & Sizemore 81924* (MO, USM). **Pasco:** Oxapampa, Chontabamba, *Smith & Brack 3073* (USM); Gran Pajonal, vic. Chequitavo, *Smith 6866* (MO); W of Oxapampa, low pass betw. Chontabamba and Suissa, *Foster & Smith 7572* (F, MO, USM); 20 km W of Oxapampa, pass before La Suiza, *Smith 5381* (MO). **San Martín:** Rioja–Pedro Ruiz, *van der Werff et al. 15464* (MO); 99 km from Rioja on rd. to Pomacocha, *Stein & Todzia 2182* (MO); Elias Soplin Vargas, Centro poblado Porvenir, Yacumama, rd. to Río Negro, *Sánchez V. & Dillon 8066* (F); Nuevo Cajamarca near Poblado Miraflores, *Sánchez V. & Dillon 8462* (CPUN, MO). BOLIVIA. **Cochabamba:** Chapare, Cochabamba–Villa Tunari, vic. of Hotel Caballeros at km 94 from Cochabamba, *Croat 51323* (LPB, MO). **La Paz:** Sud Yungas, de Chulumani, 5 km hacia Irupana–Apa Apa, *Beck 24759* (LPB); Nor Yungas, Cotapata NP, *Kroemer 732* (LPB, MO); Est. Biol. Tunquini, entrance to trail to Hornuni, *Beck 28554* (LPB).

Cultivated specimens. PERU. **Huánuco:** Leoncio Prado, Hermillo Valdizán, La Divisora, rd. from Pumahuasi to La Cumbre, 1600–1660 m, originally collected as *Plowman & Schunke 7402*), 12 Oct. 1987, *Croat 68443* (MO).

XANTHOSOMA

Xanthosoma puberulum Croat, sp. nov. TYPE: Bolivia. La Paz: Nor Yungas, La Paz–Caranavi, Chuspipata–Yolosa, 19.0 km SW of Yolosa, 16°15′55″S, 67°47′18″W, 2234 m, 4 Aug. 2000, *T. B. Croat, A. Acebey & T. Kroemer 84253* (holotype, MO-5185310; isotypes, K, LPB). Figures 8B–D, 9A.

Planta terrestris, 1.5–2.5 m alta; internodia brevia, (9)13–18 cm diam.; petiolus 63–100 cm longus; lamina ovata, sagittata ad basim, 60–85 cm longa, 47–66 cm lata; lobi postici 26–39 cm longi, 20–30 cm lati, nervis inferne

Figure 8. *Stenospermation dictyoneurum* Croat & Acebey (*Croat et al. 84270*). —A. Close-up of inflorescence. B–D. *Xanthosoma puberulum* Croat (*Croat et al. 84253*). —B. Leaf blade adaxial surface. —C. Leaf blade, abaxial surface. —D. Stem showing inflorescences.

Figure 9. —A. *Xanthosoma puberulum* Croat (*Croat et al. 84253*). Inflorescence with lower portion cut away to expose pistillate portion and sterile staminate portion of spadix. —B. *Xanthosoma seidelii* Croat (*R. Seidel & E. Richter 1198*, MO-3512834). Paratype specimen (inset of inflorescence is from second sheet of the same collection, MO-5187956).

puberulentis; inflorescentiae 5–6 in quaque axilla; pedunculus 16–24 cm longus; spatha 15–21 cm longa, tubus 5.5–6.5 cm longus, 2.8–3.4 cm diam.; pistilla viridia.

Terrestrial, 1.5–2.5 m tall; stem 0.5–1.2 m tall; *internodes* short, (9)13–18 cm diam. at base, 8–11 cm diam. at apex; basal portion of stem repent, brown with pale brown fibers and fragments of epidermis of petiole bases persisting. *Petioles* 63–100 cm long, ca. 2 cm diam. midway, obtusely flattened adaxially with a faint medial rib, slightly spongy, about as long as or to 1.2 times longer than the blades, erect-spreading, sheathed to above middle, weakly glossy, medium green, very weakly striate, the free portion weakly flattened adaxially, moderately spongy, incurled, slightly paler, bullate and undulate on margins. Leaf *blades* semi-erect, ovate and deeply lobed at base, 60–85 cm long, 47–66 cm wide, thin, matte-subvelvety above, weakly glossy, medium to dark green above, slightly paler and weakly glossy below, drying dark yellow-brown to medium yellow-green above, moderately paler and yellowish brown to yellowish green below; posterior lobes 26–39 cm long, 20–30 cm wide, obtusely pointed at apex; posterior rib naked for 3–5 cm; basal veins 11 to 13(14) pairs, none of them free to the base, 2nd pair and higher order veins coalesced into a straight posterior rib with the basal veins regularly branching off, 5 to 6 of the basal veins acroscopic, 7 to 8 of them basiscopic; *midrib* sunken and slightly paler above; sinus 11–20 cm deep, miter-shaped; major veins round-raised and slightly paler below, drying slightly paler on both surfaces; *primary lateral veins* 5 to 8 pairs, arising at 45°–70° angle, sunken and concolorous above, round-raised, slightly paler and weakly striate below; tertiary veins weakly sunken above, prominently raised below; all major and minor veins prominently puberulous on lower surface, the pubescence of the midrib most dense along the lower margin near the surface of the blades, forming a fringe; collective veins usually 2.3–10 mm from the margins. INFLORESCENCES erect, 5 to 6 per axil; *peduncle* 16–24 cm long, obtusely triangular, flattened on one side, medium green, matte; *spathe* 15–21 cm long, matte, the spathe tube 5.5–6.5 cm long, 2.8–3.4 cm diam., medium to dark green outside, sometimes also inside but weakly tinged purple inside at base usually in lines, or purple, the blade 14–16 cm long, 2.0 cm diam., creamy white on both surfaces, matte outside, weakly glossy inside; spadix 17–20 cm long, equal to or slightly longer than the spathe pre-anthesis, the pistillate

portion yellowish, 1.8 cm long in front, 1.2 cm long in back, 1.6 cm diam. at base, 1.2 cm diam. at apex; sterile staminate portion of spadix 2.5 cm long, 1.8 cm diam. at base; constricted portion of spadix 1.1 cm diam.; fertile portion of staminate spadix cream-colored, 1.1 cm diam. midway, 6 mm diam. at 1 cm from apex. Pistils medium to dark green; stigmas greenish yellow. INFRUCTESCENCES to 8 cm long, 5 cm diam.

Distribution and habitat. *Xanthosoma puberulum* is endemic to Bolivia, where it is known only from La Paz in the provinces of Nor Yungas, I. Muñecas, and Sur Yungas at 1400–2980 m elevation. It frequently grows along watercourses on steep slopes in partial shade.

The new species is recognized by its arborescent habit with a huge, thick stem partly creeping over the ground, its huge semi-erect leaves with the petioles sheathed to above the middle, and ovate, prominently lobed blades with sunken major veins and its spathe tube medium to dark green inside, weakly tinged purple inside at the base, usually in lines. This latter character and the puberulent veins on the lower blade surfaces are the most important features distinguishing this species. This species is similar to other arborescent species such as *X. undipes* (K. Koch & C. D. Bouché) K. Koch, but that species differs in having the lower blade surface glabrous and the spathe tube dark purple on the inside. *Beck 24546* may represent a juvenile plant of this species; however, it is much less pubescent than more mature plants.

Paratypes. BOLIVIA. **La Paz:** Nor Yungas, Unduavi–Caranavi, 34.8 km E of Unduavi, 16.3 km SW of Yolosa, *Croat 51573* (LPB, MO); 13.7 km NW of San Pedro on rd. through Incahuara–Mejillones and along trail to 12 de Oct., *Solomon 9619* (LPB, MO); 17 km SW of Yolosa on rd. to Chuspipata, 13.2 km NE of Chuspipata, *Solomon & Uehling 12259* (LPB, MO); 14.4 km NE of Chuspipata, 15.8 km above Yolosa, *Solomon 8615* (LPB, MO); Yolosa, 15 km toward Chuspipata, *S. Beck 13550* (LPB, MO); Yolosa hacia Chuspipata, pasando Sacramento Bajo y el derrumbe grande antiguo, *S. Beck 22477* (LPB); Caranavi–Yucumo, 32.4 km NE of Caranavi, *Croat et al. 84267* (LPB, MO, UB, US); Anmi Cotapata NP, Est. Biól. Tunquini, NW of Coroico, NNE of La Paz, vic. Chairo, 23 km W of Yolosa, *Croat et al. 84770* (LPB, MO); Chulumani–Irupana, ca. km 5, entering toward Apa Apa, *Beck et al. 24782* (LPB, MO); de Chulumani 7 km hacia Irupana, Apa Apa, *S. Beck 24546* (LPB, MO); Tarila, *Hinojosa & Aparicio 520* (LPB); I. Muñecas, Llusta, *Flores 46* (LPB).

Xanthosoma seidelii Croat, sp. nov. TYPE: Bolivia. Santa Cruz: Ichillo, 5 km WSW of El Hondo, "Potrerillo," W of Quebrada La Concha, 17°40′20″S, 63°28′35″W, 400 m, 13 Feb. 1994, *M. Nee & I. Vargas 44910* (holotype, MO-04639110; isotypes, LPB, NY, USZ). Figure 9B.

Planta terrestris, minus quam 1 m alta; tuber depresso-globosum, 6 cm diam.; petiolus 60–71 cm longus, 18–30 cm vaginatus; lamina ovato-sagittata, 30–40 cm longa, 20–25 cm lata; pedunculus 23 cm longus; spatha 13.5–19 cm longa, tubus 5.5–7.5 cm longus, atropurpureus intus.

Terrestrial, medium-sized herb to less than 1 m tall; tuber depressed-globose, those seen less than 6 cm diam., densely rooted. *Petioles* 60–71 cm long, subterete, drying greenish brown, finely striate, sheathed 18–30 cm at base, ca. 40% its length; sheath acute at apex. Leaf *blades* ovate-sagittate, 30–40 × 20–25 cm, drying very thin, dark brown to dark olive-green and matte above, moderately glossy and grayish yellow-green below; posterior lobes 11–14 cm long, 7–11.5 cm wide, rounded to narrowly rounded at apex; sinus 7–12 cm deep, ± hippocrepiform; basal veins 4 to 5 pairs, the first free to the base or nearly so, the remainder variously coalesced into a straight posterior rib that extends straight to the apex; the posterior rib not at all naked; *primary lateral veins* 4 pairs, arising at an acute angle then spreading at 40°–50° angle, nearly straight to marginal collective veins; minor veins thin, moderately distinct but not at all raised on drying. INFLORESCENCES with *peduncle* to 23 cm long, drying dark brown, 5 mm diam.; *spathe* 13.5–19 cm long; spathe tube 5.5–7.5 cm long, green to purplish on outside, dark purple on inner surface; spathe blade 10 cm long, creamy white on both surfaces; *spadix* slightly shorter than spathe; pistillate portion to 2.7 cm long in front, 1.9 cm long on back, drying 7–8 mm diam., narrowed toward apex (color not reported but drying grayish lavender with fine dark purple longitudinal stripes throughout its length, the stigma drying dark brown to purplish, 1.0–1.2 mm diam.); sterile staminate portion 3.5 cm long, ca. 2.0 cm diam., the lowermost row of flowers 3–4 mm long, 1–2 mm wide; the other flowers about as broad but much longer, 7–9 mm long, fertile staminate portion not seen.

Distribution and habitat. *Xanthosoma seidelii* is apparently endemic to Bolivia, where it is known in La Paz and Santa Cruz at 400–1400 m.

The new species is characterized by its medium size, subglobose tubers, ovate-sagittate blades that lack a naked posterior rib and dry moderately glossy on the lower surface, and purple inner spathe tube and pistils that dry with fine purplish lines on the ovary.

The new species is most similar to *X. sagittifolium* K. Koch, which also has leaf blades lacking naked posterior lobes, but differs in its moderately glossy (rather than matte and bluish green) lower

blade surface, and purple (rather than green) inner spathe tube surface.

A juvenile collection (*M. Moraes & E. Oviedo 2025*) from Beni in Yacuma may also be this species. Its blades differ in being proportionately narrower with posterior lobes narrowed to a blunt point.

The species is named in honor of German botanist R. Seidel, who along with E. Richter collected the species for the first time in 1988.

Paratype. BOLIVIA. **La Paz:** Nor Yungas: Río Unduavi valley, Santa Rosa–Machacamarca, above Lamina San Silvestre, *R. Seidel & E. Richter 1198* (LPB, MO).

Acknowledgments. The authors wish to acknowledge the herbarium staff at LPB, MO, NY, USZ, and US for making material available to us; Fred Keusenkothen (MO), who generously digitized and processed the digital images; and Monica Carlsen (MO), responsible for initial preparation, and Emily Yates (MO), responsible for final preparation and editing of the manuscript and images. The authors also thank Mike Grayum for advice on Latin usage.

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Teratophyllum hainanense (Lomariopsidaceae), a New Species from Hainan Island, China

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ABSTRACT. A new species of Lomariopsidaceae, *Teratophyllum hainanense* S. Y. Dong & X. C. Zhang, from Hainan Island, China, is described and illustrated. It is related to *T. koordersii*, but differs in having 10 to 12 pairs of pinnae in mature bathyphylls and the scales of sterile pinnae on both midribs and veinlets as substellate, appressed, and small, with diameters only to ca. 0.2 mm. The genus *Teratophyllum* itself is reported from China for the first time.

Key words: China, Lomariopsidaceae, *Teratophyllum*.

Teratophyllum Kuhn is confined to the Paleotropics and comprises 12 species (Holttum, 1966, 1978). It extends from southern Burma to eastern Polynesia and Queensland, with most species in Malesia (Kramer, 1990). This genus has not been previously reported from China.

During an expedition of the fern flora of Hainan Island in May 2002, we collected a climbing fern without fertile fronds on Mt. Tiedingling and did not know its identity. We made another trip to Mt. Tiedingling in April 2003 and observed fronds of the unknown species at various stages and became convinced that it belongs to the genus *Teratophyllum*. Compared with *T. aculeatum* (Blume) Mettenius ex Kuhn and *T. ludens* (Fée) Holttum, two species from neighboring regions of the Indochina Peninsula, this species from Hainan is very different. It is distinguished from *T. aculeatum* by once-pinnate bathyphylls with crenate pinnae and from *T. ludens* by pinnae lanceolate and asymmetric at base in both bathyphylls and acrophylls. In addition to *T. ludens*, there are three other species in *Teratophyllum* with the pinnae of bathyphylls crenate, i.e., *T. arthropteroides* (H. Christ) Holttum, *T. clemensiae* Holttum, and *T. koordersii* Holttum, all in section *Teratophyllum* (Holttum, 1978). The new species from Hainan is distinct from *T. arthropteroides* and *T. clemensiae* by its linear fertile pinnae. However, it is similar to *T. koordersii* from Luzon and the Celebes, differing in having 10 to 12 pairs of pinnae on mature bathyphylls (vs. 2 to 6 pairs) and the scales of sterile pinnae on both costae and veinlets as substellate, appressed, and small (ca. 0.2 mm diam.).

Teratophyllum hainanense S. Y. Dong & X. C. Zhang, sp. nov. TYPE: China. Hainan Island: Qiongzhong County, N slope of Mt. Tiedingling, 18°57′10″N, 109°42′19″E, 720 m, 11 Apr. 2003, *S. Y. Dong 818* (holotype, PE [2 sheets]; isotypes, L, MO, P, PE). Figures 1, 2.

Affinis *T. koordersii* a quo differt bathyphyllorum maturorum pinnis lateralibus 10–12 jugatis, squamis pinnarum acrophyllorum ad costam mediam et nervulos nascentibus appressis substellatis ca. 0.2 mm diametro, pinnis fertilibus linearibus, 13–18 cm longis et 0.8 mm latis.

Mature plants. *Rhizome*, 3–4 × 2 mm, green, dorsiventral, roots on the ventral surface and 2 rows of fronds on the dorsal surface, without obvious spines but with a few remaining spine bases; apex of rhizome and buds of fronds covered with brown lanceolate scales (ca. 8 mm long). *Sterile acrophylls*, usually 50–65 × 18–23 cm, stipe 8–13 cm long, swollen at base; rachis not winged, stramineous; pinnae 8 to 11 pairs, alternate, all articulate; petiolules 2–7 mm long, pinnae usually about 11 × 2.5 cm, largest to 16 × 3.4 cm, broadest near base, the proximal and basal portions nearly parallel-sided, tapering gradually from the middle to an acute apex, acroscopic base rounded or round-truncate, basiscopic base cuneate; texture green, papyraceous; midribs prominent both above and below, usually pale; veins ca. 1.5–2 mm apart, slightly

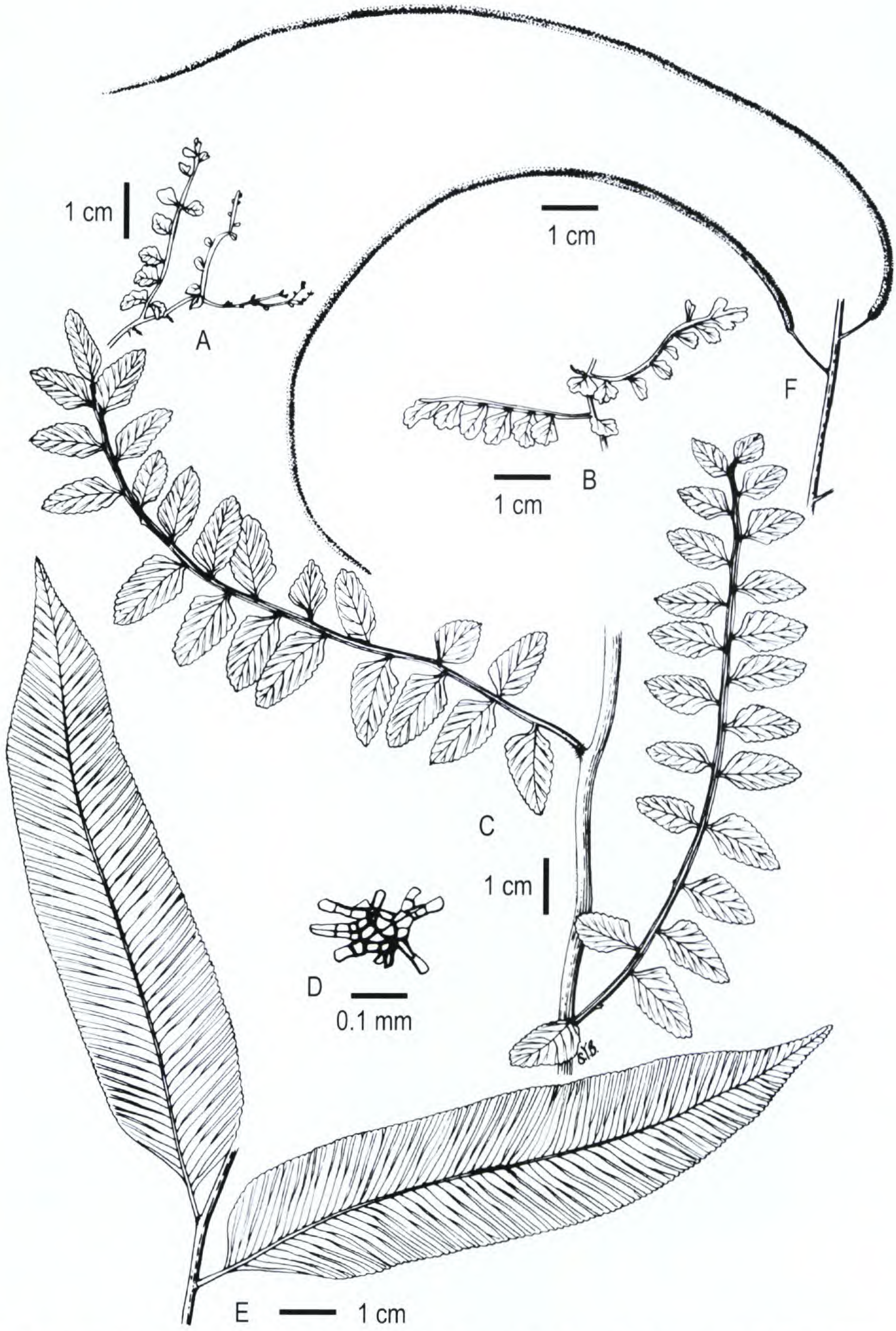
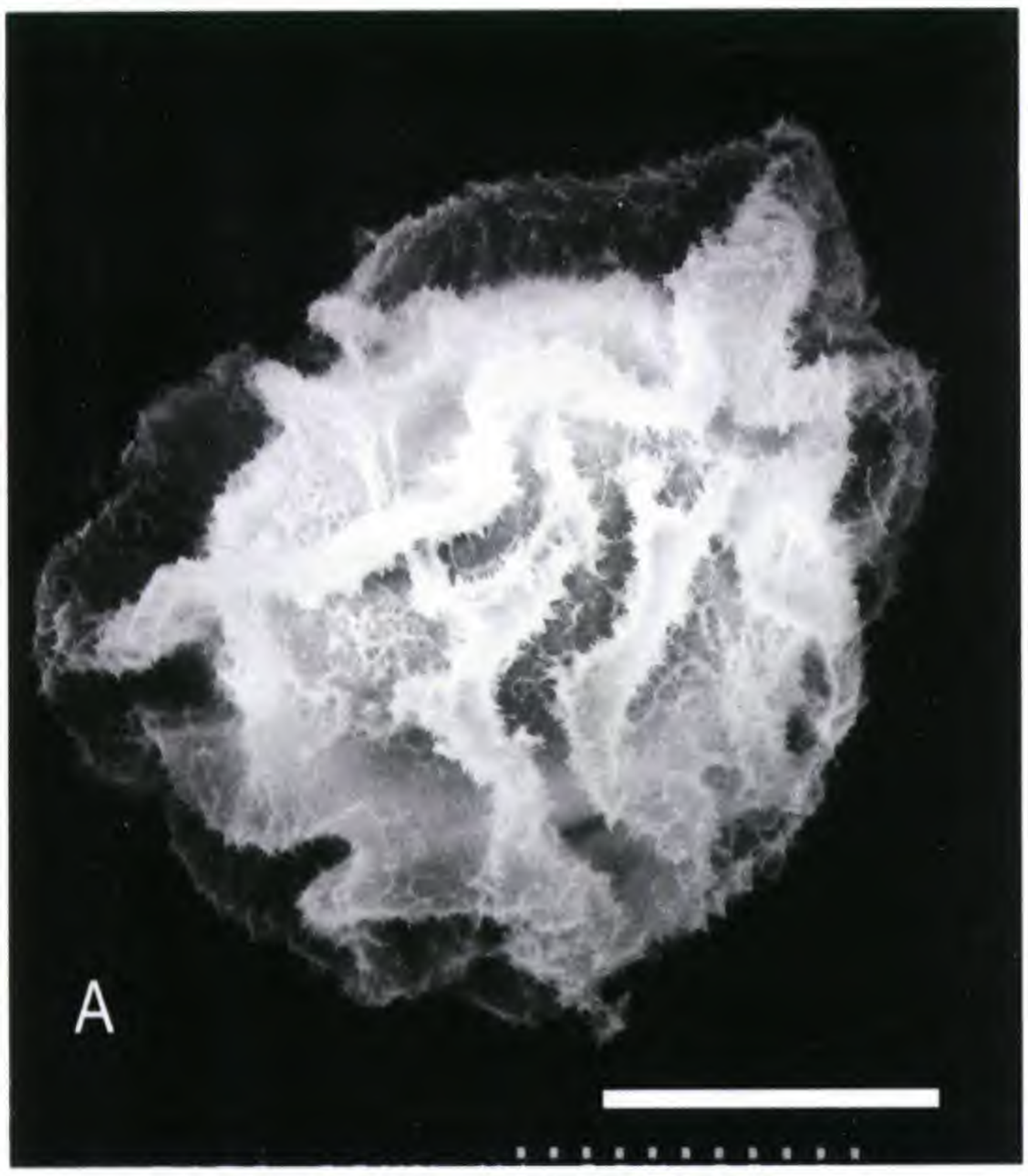


Figure 1. *Teratophyllum hainanense* S. Y. Dong & X. C. Zhang. Based on the holotype, *S. Y. Dong 818* (PE). —A. Bathyphylls, early stage. —B. Dimidiate bathyphylls. —C. Mature bathyphylls. —D. Scale from lower surface of sterile acrophyll. —E. Pinnae of sterile acrophyll. —F. Pinnae of fertile acrophyll. Drawn by Sun Ying-Bao.

prominent on both surfaces, forked once or twice, ending ca. 0.2 mm from the margin or reaching the margin; margin nearly entire or slightly crenate (Fig. 1E); midribs and veinlets abaxially bearing numerous minute substellate scales (ca. 0.2 mm diam.), the scales brown, appressed (Fig. 1D). *Fertile acrophylls*, 3 seen, ca. 30 × 15–20 cm, stipe 5–8 cm long, stipe and rachis pale; pinnae about



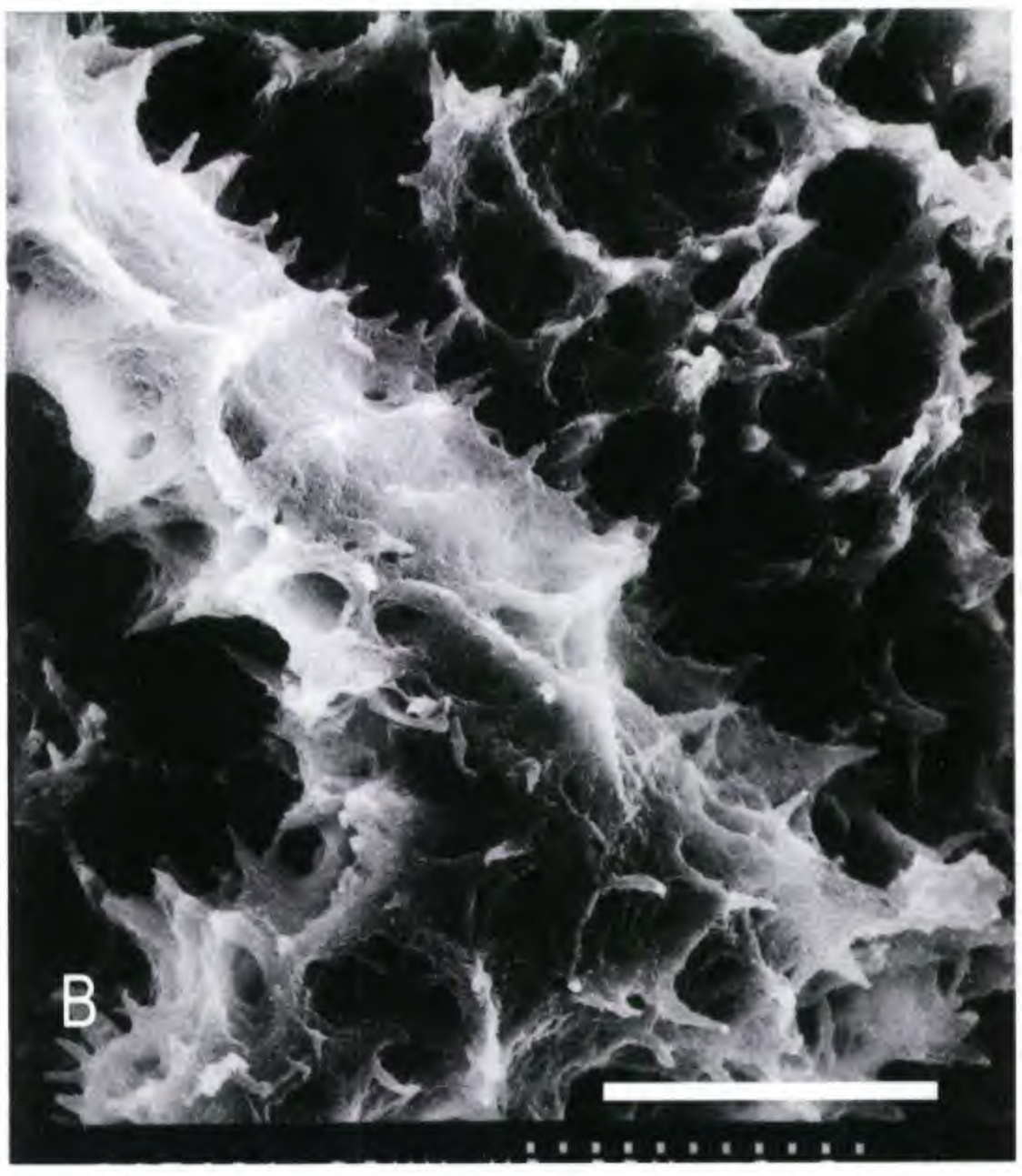


Figure 2. *Teratophyllum hainanense.* —A, B. SEM micrographs of spores. (A: scale bar 23.1 μm; B: scale bar 3.8 μm). —C. Adult sterile and fertile leaves. —D. Young and mature bathyphylls. All from *S. Y. Dong 818* (PE).

10 pairs, petiolules 6 mm long, pinnae linear, usually 13–16 × 0.8 mm, the longest to 18 cm long; sporangia covering the abaxial surface and appearing to cover both surfaces when mature, the width of the pinnae then expanding to ca. 1.5 mm (Fig. 1F). Sporangia containing 32 spores each, spores large, 50–72 μm diam., with a folded echinulate perispore (Fig. 2A, B).

Early stage. Very young fronds ca. 2 cm long, with 6 small pinnae on the basiscopic side of the

Table 1. Features distinguishing *Teratophyllum ludens*, *T. koordersii*, and *T. hainanense*.

Characters	*T. ludens*	*T. koordersii*	*T. hainanense*
Pinnae of transition bathyphylls	elliptic or ovate, symmetric at base, 5 to 9 on basiscopic side of rachis and 0 to 2 on acroscopic side	lanceolate, asymmetric at base, 2 to 6 on basiscopic side of rachis and 2 to 5 on acroscopic side	lanceolate, asymmetric at base, 8 to 14 on basiscopic side of rachis and 4 to 12 on acroscopic side
Petiolules of pinnae of sterile acrophylls	0–5 mm long	0–5 mm long	2–7 mm long
Scales on pinnae of acrophylls	lanceolate, ciliate, ca. 0.6 mm long on midribs, and substellate, ca. 0.2 mm diam. on veinlets	lanceolate with branches at base, curled, ca. 1 mm long, only on midribs	substellate, appressed, ca. 0.2 mm diam., on midribs and veinlets (Fig. 1D)
Fertile pinnae	14–20 cm long, 2–3 mm wide	20–24 cm long, 2.5–3 mm wide	13–16(18) cm long, 0.8 mm wide (Fig. 1F)

rachis and 4 on the acroscopic side, the basal pinna like those in other stage bathyphylls, reflexed and overlapping the rhizome at a right angle, the 4 pinnae on the acroscopic side near the apex of fronds; fronds to develop next ca. 3.5 cm long, with 7 pinnae evenly distributed on the basiscopic side of rachis and 3 on the acroscopic side: 1 at the base, 1 on the distal portion, and 1 near the apex (Fig. 1A); rachis winged throughout, both surfaces of fronds scaly, the scales substellate with branches less than 0.2 mm long, like those on mature plants but smaller, with fewer branches and fewer cells in the center, the scales on the joint of rachis and rhizome lanceolate, ca. 1 mm long and 0.5 mm wide at base.

Dimidiate bathyphylls. Fronds 3–10 × 0.5–1.5 cm, the terminal part shallowly or deeply lobed, usually 7 to 9 pinnae presenting on the basiscopic side of rachis and no pinnae on the acroscopic side, rachis narrowly winged throughout; pinnae 0.5–1 × 0.5 cm, ± flabellate or ± rhomboid, crenate on the margin, rounded at apex, upper base subtruncate, lower base narrowly cuneate (Fig. 1B).

The form of the dimidiate fronds is not constant. The 2 to 6 pinnae near the apex of the fronds are inserted on the acroscopic side of the rachis in some cases. This stage bathyphylls in some plants and in branches above ground absent.

Transition bathyphylls. Fronds 10–15 × 2–4 cm, sessile, asymmetric at base, 2 to 3 acroscopic basal pinnae usually absent, the terminal pinna jointed to the rachis; rachis narrowly winged throughout, with 8 to 14 pinnae on the basiscopic side of rachis and 4 to 12 pinnae on the acroscopic side; pinnae 1–2.5 × 0.7–1 cm, crenate, round or blunt at apex, upper base truncate or broadly cuneate, lower base narrowly cuneate, veins usually forked, the end not reaching the margin (Fig. 1C); laminar tissue papyraceous or subcoriaceous, the adaxial surface glabrous, the abaxial surface densely covered with minute substellate scales along midribs and veinlets.

A population of about 20 plants was observed in primary rain forest on the north slope in Mt. Tiedingling on Hainan Island, China. Early stage and dimidiate stage bathyphylls were presented only on stems creeping on the ground. Stems bearing next stage fronds were observed as climbing on tree trunks. When the rhizomes have ascended to 2–3 m, the fronds on the middle and lower parts of stems wither and are shed. Fertile fronds are produced near the apex of high-climbing stems. When fertile fronds are present, except for fertile pinnae and several sterile fronds, the other lower fronds are absent.

Of the known species of *Teratophyllum*, the normal bathyphyll stage is absent only in *T. ludens* and *T. koordersii* (Holttum, 1932). *Teratophyllum hainanense* is the third species without the normal bathyphyll stage (fronds having pinnae equally on both sides, and the pinnae being gradually smaller in size toward apex, the frond apex not being articulate). It is not close to *T. ludens*, but instead to *T. koordersii*. The distinguishing characters between *T. ludens*, *T. koordersii*, and *T. hainanense* are given in Table 1.

Paratype. CHINA. **Hainan Island:** Qiongzhong County, N slope of Mt. Tiedingling, similar to holotype, 25 May 2002, *S. Y. Dong & Z. C. Chen 639* (PE).

Acknowledgments. This study is supported by Kadoorie Farm & Botanic Garden of Hong Kong and the Chinese Academy of Sciences. We are greatly indebted for the loan of collections from L and P. We also thank Wang Wen-Tsai for preparing

the Latin diagnosis, Sun Ying-Bao for drawing the illustrations, and Xiao Yin-Hou for SEM assistance.

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A New Combination in *Oxypolis* Rafinesque (Apiaceae)

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ABSTRACT. *Oxypolis ternata* (Nuttall) A. Heller (Apiaceae) is superseded by the new combination *O. denticulata* (Baldwin) J. R. Edmondson, which is lectotypified herein.

Key words: Apiaceae, lectotypification, North America, *Oxypolis*.

While preparing a catalog of a collection of William Baldwin's plants from Georgia in the Smithian herbarium of the Linnean Society of London (LINN), I became aware that a species of Apiaceae, *Peucedanum ternatum* Nuttall, published in July 1818, was synonymous with *Sium denticulatum* Baldwin (Baldwin in Elliott, October 1817), which was represented at LINN by an isotype.

When Rafinesque established the new genus *Oxypolis* (Rafinesque, 1825) he included *Sium denticulatum* under *Oxypolis*, but failed to make a new combination for the species *Sium denticulatum* (according to the Gray Herbarium index, ref. Id: 60428103–2). The genus itself was subsequently lectotypified by N. L. Britton (in Britton & Brown, 1913, vol. 2: 637) with the type species *O. rigidior* (L.) Rafinesque (*Sium rigidius* L.) as the generitype.

Oxypolis ternata (Nuttall) A. Heller is the commonly cited modern name (see, for example, Duncan & Kartesz, 1981: 99) for *Sium denticulatum*, but as this combination is based on an epithet published later than the one which appeared in Elliott's work, it is contrary to Article 11.4 of the rules of nomenclature (Greuter et al., 2000). It is therefore necessary to make a new combination:

Oxypolis denticulata (Baldwin) J. R. Edmondson, comb. nov. Basionym: *Sium denticulatum* Baldwin, in Elliott, Sketch Bot. S. Carolina, 1: 354 (Oct. 1817). *Peucedanum ternatum* Nuttall, Gen. N. Amer. Pl. 1: 182 (July 1818). TYPE: U.S.A. Georgia: *W. Baldwin s.n.* (lectotype, designated here, LINN-Smith no.: 508.5).

I have chosen the Linnean Society specimen as lectotype as it is the only one I have personally examined; Elliott did not typify Baldwin's name as the type concept had not then been established.

Acknowledgments. This work was based on the Linnean Society's database of their Smithian Herbarium, compiled by Claire Sedgwick, to whom I am greatly indebted for creating this invaluable resource. I am also grateful to Kanchi Gandhi (Harvard University) for checking my nomenclatural note on *Sium denticulatum* in the manuscript catalog.

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Cyanotis repens (Commelinaceae): A New Species from Tropical Africa

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ABSTRACT. *Cyanotis repens*, a mat-forming perennial, is described from Kenya in tropical Africa. It differs from related species by its prostrate habit, indeterminate flowering shoots, and fusiform swelling terminating the style. Two subspecies are recognized, diploid *C. repens* subsp. *repens* from Kenya, Tanzania, and Uganda, and polyploid *C. repens* subsp. *robusta* from Kenya, Tanzania, Uganda, Rwanda, Democratic Republic of Congo, and Gabon. *Cyanotis repens* belongs to the Cyanotis foecunda species group, the species of which have a basic chromosome number of $x = 13$ and often distinctive karyotypes.

Key words: Commelinaceae, *Cyanotis*, tropical Africa.

With approximately 25 species (of 50 worldwide) in Africa and Madagascar, *Cyanotis* D. Don is the third largest genus of the Commelinaceae in the region (after *Commelina* L. and *Aneilema* R. Brown). The genus and several of its species are widespread outside of forested habitats. There is no major concentration of species, but endemism is relatively high in the flora of southern Africa and flora of West Tropical Africa and low in other parts of the African continent (Faden, 2001). The new species described below has been known to the senior author since the 1960s, and it has sometimes been cultivated as "Cyanotis somaliensis" perhaps even longer.

Cyanotis repens Faden & D. M. Cameron, sp. nov. TYPE: Kenya. Kilifi District: Nwarakaya [= Mwarakaya], 3°47.5′S, 39°42′E, 150 m, limestone rocky outcrops, 21 Nov. 1978, *J. P. M. Brenan, J. H. Brenan, J. B. Gillett et al. 14672* (holotype, K; isotypes, EA, US). Figure 1.

Herba perennis base distincta carens plerumque tegetem plus minusve prostratam formans. Folia haud decrescentia apicem versus surculorum florentium; vaginis foliaribus 3–13 mm longis, 2.5–9.0 mm latis. Inflorescentiae omnes sessiles axillares in vaginis foliaribus inclusae. Flos stylo glabro in tumorem terminalem fusiformem desinente.

Perennial herb lacking a distinct base, usually forming a ± prostrate mat; roots thin, fibrous; shoots sparsely to densely branched basally, unbranched distally, repent to decumbent and rooting at nodes; internodes to 6 cm long, densely pilose or sometimes slightly woolly to glabrescent or glabrous, often red to maroon; flowering shoots distal. Leaves distichous, not decreasing in size distally on the flowering shoots; sheaths 3–13 × 2.5–9.0 mm, sparsely to densely pilose or slightly woolly, ciliate at apex, lamina sessile, succulent, ovate to ovate-elliptic, narrowly elliptic or lanceolate-oblong, (0.7–)1–6(–9.5) × 0.5–1.8 cm, the apex acute, rarely acuminate, sometimes ± mucronate, the base broadly cuneate to rounded or cordate, often amplexicaul, the margins ciliate, the surfaces subglabrous to densely pilose, the adaxial lustrous green, often dotted with maroon, the abaxial often maroon or suffused with maroon. Inflorescences sessile, axillary, contracted, 1- to several-flowered cincinni, enclosed in leaf sheaths, borne at many nodes; bracteoles scarious, subulate or linear-oblanceolate, 1.5–8.5 mm long, glabrous or pilose. Flowers bisexual, 4–8 mm wide, sepals 5.0–9.4 mm long, fused basally for 2.8–5.4 mm, the lobes subulate, oblanceolate to obovate, elliptic or linear, densely pilose, the apex acute; corolla 8.0–10.8 mm long, the tube 4.7–6.7 mm long, the lobes ovate to obovate, 3.1–5.0 × 2.5–4.5 mm, bluish purple or blue-violet, rarely pink, the apex acute to obtuse; stamens 6, fertile, equal, filaments 9.8–11.8 mm

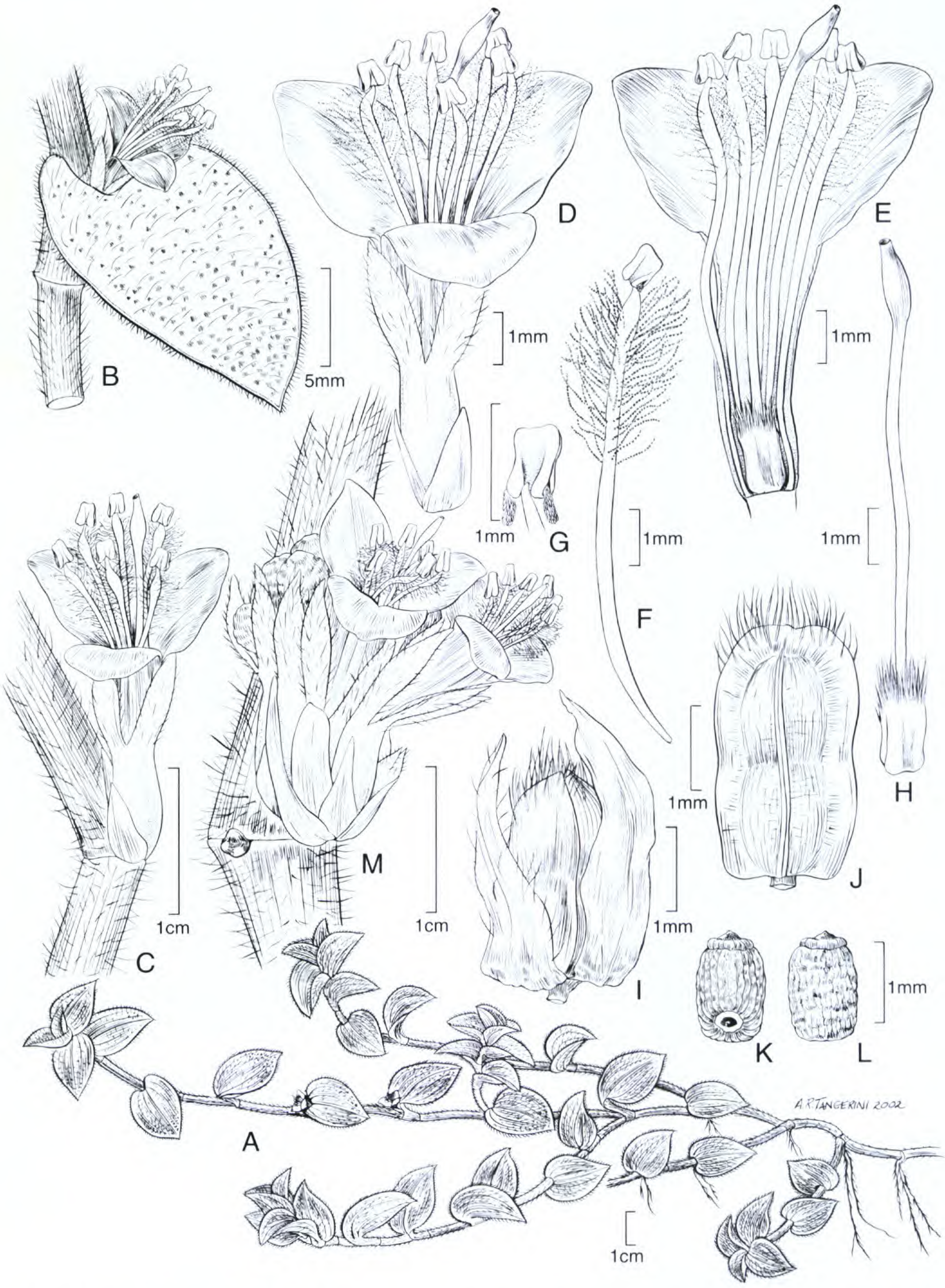

Figure 1. *Cyanotis repens* Faden & D. M. Cameron. A–L. *Cyanotis repens* subsp. *repens*. —A. Habit. —B. Inflorescence. —C. Inflorescence, leaf removed. —D. Flower, lateral view. —E. Flower, front half removed. —F. Stamen. —G. Anther, showing dehiscence by basal pores. —H. Gynoecium. —I. Capsule. —J. Capsule, sepals removed. —K. Seed, ventral view. —L. Seed, dorsal view. M. *Cyanotis repens* subsp *robusta*. —M. Inflorescence. A–L from *Cameron 02/02 ex Faden & Faden 74/1174* (cultivated); M from *Cameron 02/07 ex Faden, Evans & Lye 69/1067* (cultivated).

long, with an ampulliform or fusiform subapical swelling, pale blue-violet, densely bearded distally for 2.2–3.3 mm with white-tipped, blue or bluish purple, moniliform hairs, the anthers oblong-elliptic to ovate, 0.5–1.0 × 0.6–0.9 mm, dehiscing by basal pores, entirely yellow; ovary 1.1–1.7 mm long, densely pubescent at or near the apex, the style 7.5–11.0 mm long, whitish, glabrous, with a terminal fusiform swelling 1.2–2.1 mm long. Capsules trilocular, trivalved, 2.0–3.7 × 1.0–1.5 mm, the apex hirsute; seeds (1 or)2 per locule, oblong-ellipsoid to ovoid-ellipsoid, 1.1–2.0 × 0.75–1.05 mm, the testa brown or reddish black, finely striate longitudinally, with transverse pits and grooves.

Two subspecies are recognized.

KEY TO THE SUBSPECIES OF *CYANOTIS REPENS*

1a. Leaf blades mostly 1.0–2.5 cm long, rarely to 5.2 cm long; sheaths 3–5(–7) × 2.5–4.0 mm (1.0–6.5 mm wide when pressed); inflorescences 1- or 2(or 3)-flowered (to 5-flowered in cultivation); bracteoles 1.5–2.5 mm long; filaments 9.8–10.9 mm long; capsules 2.0–2.6(–3.5) mm long; seeds 1.10–1.25(–1.50) mm long . . . . . subsp. *repens*

1b. Leaf blades mostly 2–6 cm long, the longest generally at least 4 cm long, sheaths 5–13 × 5–9 mm (3.5–7.0 mm wide when pressed); inflorescences 5- or more-flowered; bracteoles 4.0–8.5 mm long; filaments 11.2–11.8 mm long; capsules 2.6–3.7 mm long; seeds 1.25–2.00 mm long . . . . . subsp. *robusta*

1a. Cyanotis repens Faden & D. M. Cameron subsp. **repens.** Figure 1A–L.

Leaf blades 1.0–2.5(–5.2) × 0.5–1.0(–1.8) cm; sheaths 3–5(–7) × 2.5–4.0 mm (1.0–6.5 mm wide, when pressed); inflorescences usually 1- or 2(or 3)-flowered (to 5-flowered in cultivation); bracteoles 1.5–2.5 mm long; filaments 9.8–10.9 mm long; capsules 2.0–2.6(–3.5) mm long; seeds 1.10–1.25(–1.50) mm long, the testa sometimes reddish black.

Habitat. Dry or moist forest and forest edges, thickets, bushland, river banks, woodland, moist grassland; often associated with rocky outcrops, especially limestone, almost always in shade or partial shade, in sandy soil to clay; just above sea level to 1000(–1980) m; flowering plants have been collected in all months, with a slight peak from July through October.

Chromosome number. $2n = 26$ (Faden & Suda, 1980, as *Cyanotis* sp. A; Faden, unpublished).

Distribution. Southeastern Kenya (K7–flora districts of Polhill, 1988), northeastern Tanzania (T3, 6), and eastern Uganda (U3). Figure 2.

Paratypes. KENYA. **Kilifi:** Cha Simba, 22 km SW of Kilifi, *B. R. Adams 98* (EA, K); Kaloleni–Kilifi rd. (via N rd.) ca. 14 km, *R. B. Faden & A. Evans 70/785* (EA, US); Sokoke Forest, rd. to Jilore Forest Station, 3.2 km from turnoff on Kilifi–Malindi rd., *R. B. Faden & A. J. Faden 71/715* (EA, US); Chasimba, Mariakani–Kaloleni rd. ca. km 14, ca. 13 km NE of Kaloleni, *R. B. Faden & A. J. Faden 71/768* (EA, K, US); Mariakani–Kaloleni rd., 8.6 km, *R. B. Faden & A. J. Faden 71/834* (EA, K, US); Sala Gate–Malindi rd., 7 km tow. Sala Gate from jt. w/Bamba–Kakoneni rd., *R. B. Faden & A. J. Faden* (EA, K, US); Arabuko, *R. M. Graham B676* [*K2061*] (EA, K); Sokoke Forest, *G. W. Jeffrey K257* (EA); Sokoke, *G. W. Jeffrey K336* (EA, K); Jaribuni (Kauma), *B. M. Musyoki & O. J. Hansen 966* (EA, K); Marafa, 25 mi. [40 km] NW of Malindi, *R. M. Polhill & S. Paulo 788* (EA, K); Cha Simba, *S. A. Robertson 5217* (EA, K, MO, US); Mangea Hill, *S. A. Robertson 5218* (EA, K, MO, US); Mwarakaya, *S. A. Robertson & V. C. Gilbert 3700* (EA, K); Ndzovuni Gorge at ford 7 km N of Mtsengo, *S. A. Robertson & Q. Luke 6160* (EA, K, US), *6161* (US); ex Dakabuko Hill on Galana Ranch, *S. A. Robertson & Q. Luke 6469* (EA, US). **Kilifi/Kwale:** Giryama & Tsimba Mountains, 1887, *W. E. Taylor s.n.* (BM). **Kwale:** Mwachi River, *P. R. O. Bally 13938* (EA); Buda Mafisini Forest, 8 mi. [13 km] WSW of Gazi, *R. B. Drummond & J. H. Hemsley 3945* (K); Shimba Hills Reserve, beside path to Sheldricks Falls, *A. Faden 8/82* [grown at Smithsonian Institution, pressed as *D. M. Cameron 02/12* (US)]; Mganemi, 2.8 km from Samburu on Voi rd., *R. B. Faden & H. Beentje 85/68* (EA, K, US) [also grown at Smithsonian Institution, pressed as *D. M. Cameron 02/04* (US)]; Lungalunga–Vanga rd. ca. 0.5 km, *R. B. Faden & A. J. Faden 77/365* (EA, F, K, MO, US, WAG); Mwachi Forest, N end, along Mwachi River, *R. B. Faden et al. 77/491* (EA); Mombasa–Nairobi rd., 2.5 km tow. Mombasa from turnoff to Maji ya Chumvi Railway Station, *R. B. Faden & A. J. Faden 77/575* (EA, F, US); Nairobi–Mombasa hwy., ca. 8 km E of Makinnon Stn., *P. Kuchar 7327* (EA); Maluganji For. Res. (including Kaya Mtae), *S. A. Robertson & Q. Luke 6017* (EA, US). **Lamu:** Garsen–Witu rd., near Nyangoro bridge, *R. B. Faden & A. J. Faden 74/1154* (EA, K, MO); Lunghi Forest Reserve (proposed), *Q. Luke & S. A. Robertson 1455* (EA). **Tana River:** Garsen–Malindi rd., ca. 8 km from Garsen, *R. B. Faden 72/231* (EA, K, US); Galole–Garsen rd., 13 km from Galole, *R. B. Faden & A. J. Faden 74/1034* (EA, K, MO); Malindi–Garsen rd., 0.8 km tow. Garsen from turnoff to Kibusu, *R. B. Faden & A. J. Faden 74/1174* (EA, K, MO) [also grown at Smithsonian Institution, pressed as *D. M. Cameron 02/02* (US)]; SE of Garsen on Garsen–Malindi rd., *P. J. Greenway in EA11007* (EA); 2.7 km N of Lango ya Simba, E of new dyke, *S. A. Robertson & Q. Luke 5360* (EA). **Teita:** Mt. Kasigau, lower slopes of S side above Bungule, *R. B. Faden & A. Evans 70/966A* (EA, K, MO); Voi–Taveta rd., 18 km tow. Taveta from Nairobi–Mombasa rd. turnoff, *R. B. Faden & A. J. Faden 74/534* (K, EA, MO); 18 km on Voi–Taveta rd., from Nairobi–Mombasa rd., at yellow sign post CH 620, *R. B. Faden & A. J. Faden 77/312* (K, MO, US); Taita Hills, Msau River Valley, *Taita Hills Expedition 742* (EA) [also grown at Smithsonian Institution, pressed as *D. M. Cameron 02/03* (US)]. TANZANIA. **Pwani Region. Bagamoyo:** Pongwe [forest reserve], *B. J. H. Harris, T. Pócs & T. M. Tadros in B. J. H. Harris 4416* (K). **Tanga Region. Pangani:** Segera Forest, *Faulkner 3830* (K), *Faulkner 4001* (K). **Handeni:** Kwa Mkono, 30 km E of Handeni, *Archbold 2228* (K); 4.4 km tow. Maramba from Daluni turnoff on Maramba–Korogwe rd., *R. B. Faden et al. 74/329*

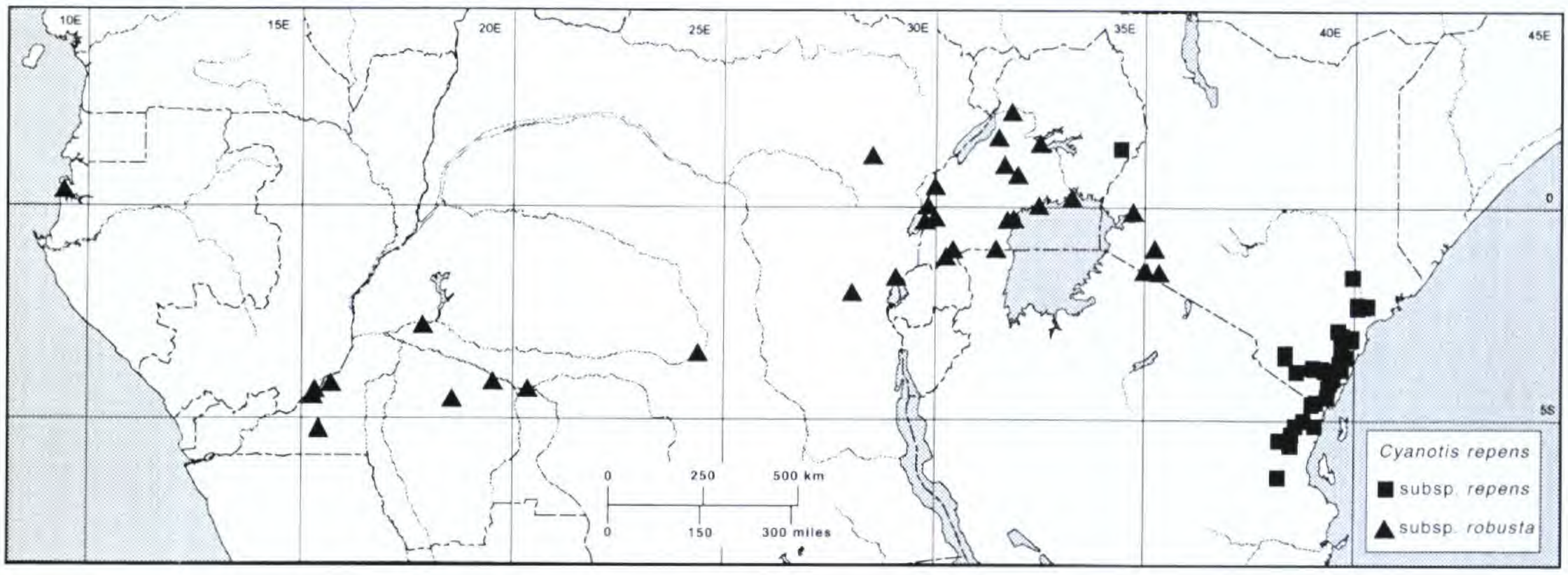

Figure 2. Distribution of *Cyanotis repens* subsp. *repens* (squares) and *Cyanotis repens* subsp. *robusta* (triangles).

(MO); bridge over Msangasi stream, ca. 50 km straight S of Korogwe (rd. to Dar es Salaam), *Flock 463* (EA, K). **Lushoto:** Mtai Forest Reserve, Mbunta, *Kindeketa et al. 114* (MO, US). **Lushoto/Handeni:** Korogwe–Handeni rd., *Faulkner 1329* (K). **Tanga:** Perani forest, SE Umba steppe, *R. B. Drummond & J. H. Hemsley 3714* (K); Muheza–Amani rd., 1.5 km tow. Muheza from Kisiwani (near Sigi), *R. B. Faden & A. J. Faden 74/343* (EA, K, MO); Usambaras, Düga, *G. Holst 3163* (K); Tanga, *E. Organ in EA14912* (EA, K). UGANDA. **Mbale:** Kapchorwa, *E. Lind 345* (K).

1b. Cyanotis repens subsp. **robusta** Faden & D. M. Cameron, subsp. nov. TYPE. Kenya. Narok District (Masai District of Polhill, 1988): Ngerendei, near Mara River, 5500 ft. [1676 m], edge of water course associated with *Euclea, Olea* thicket, 13 Apr. 1961, [*P. E.*] *Glover*, [*M. D.*] *Gwynne & Samuel* [*Kibuwa*] *463* (holotype, K; isotype, EA). Figure 1M.

A subspecie typica foliorum laminis longioribus et vaginis longioribus latioribusque, inflorescentiis minimum 5-floris, bracteolis longioribus, filis staminum longioribus atque capsulis seminibusque plerumque longioribus differt.

Leaf blades (1.5–)2–6(–9.6) × 0.8–1.5 cm (the longest generally at least 4 cm long); sheaths 5–13 × 5–9 mm (3.5–7.0 mm wide when pressed); inflorescences 5- or more-flowered; bracteoles 4.0–8.5 mm long; stamen filaments 11.2–11.8 mm long; capsules 2.6–3.7 mm long; seeds 1.25–2.00 mm long, the testa brown.

Habitat. Thickets, thicket edges, forest edges, stream and river banks, lake edges, sometimes associated with rocks, shade or partial shade, sandy soil to clay loam; 700–1820(–2130) m. Flowering March through December.

Chromosome number. $2n = 78$ (Faden & Suda, 1980, as *Cyanotis* sp. B); $2n = 52$ (Faden, unpublished).

Distribution. Northwestern Tanzania (T1), southwestern Kenya (K5, 6), southern Uganda (U2, 4), Rwanda, Democratic Republic of Congo, and Gabon? (see discussion). Figure 2.

Paratypes. DEMOCRATIC REPUBLIC OF CONGO. **Beni:** Parc Nat. Albert, Mutsora riv. Talya (affl. droit Lumu [= Lume]), *G. F. de Witte 10534* (BR, US). **Bulungu:** vers Makamba, *L. Pauwels 5562* (BR). **Idiofa:** Ipamu, *H. Vanderyst 12857* (BR). **Katako Kombe:** Katakokombe (Maniema), *J. Lebrun 6116* (BR, US). **Kinshasa:** Dolo, *Bavicchi 275 bis* (BR); Près de Menkao, *H. Breyne 2368* (BR); Kinshasa, Université Lovanium Plateau des Facultés, *C. Evrard 6426* (BR, MO). **Kole:** Bena Dibele, *J. Claessens 204 bis* (BR). **Kutu:** Mongonjiale, *Flamigni 6273* (BR). **Madimba:** Mpese, *H. Vanderyst 34673* (BR) & *39007* (BR). **Mambasa:** Ituri, ca. 14 km SSW of Epulu and 2 km S of Tito River, *R. E. Gereau et al. 5282* (MO, US). **District Unknown:** Kasai, *Achten 526b* (BR); Parc Nat. Albert, Marais de la Malebolau, affl. Ilimba, *G. F. de Witte 10789* (BR); Marende inselberg, on Bukavu–Kisangani rd., *S. Porembski & N. Biedinger 1810* (US) [also grown at Smithsonian Institution, pressed as *D. M. Cameron 02/05* (US)]; Kashindi, *Terashima 213* (BR). **Locality Unknown:** *Demeuse 96* (BR), *L. Mastromatteo 1062* [grown at Smithsonian Institution, pressed as *D. M. Cameron 02/11* (US)]. GABON. **District Unknown:** Libréville, *Baudon 108* (BR). KENYA. **Kisumu-Londiani:** Kisumu, *Opiko in P. R. O. Bally B664* (EA, K). **Masai:** Masai Mara Res., Telek River, *P. R. O. Bally B5269* (K); Masai Mara Nat. Park, in riverine forest bordering Mara River at Hippo Lookout, *A. Faden 4/79* [grown at Smithsonian Institution, pressed as *D. M. Cameron 02/10* (US)]; Masai Mara, near res. st., *M. G. Gilbert 5734B* (EA, K). RWANDA. **Byumba:** Rég. Du Mutara, env. de Nimuli, réserve IRSAC, Biumba, *G. Troupin 3306* (K). **Kibungo:** Parc Nat. de l'Akagera, plateau de Matinza, *G. Bouxin & M. Radoux INRS/210* (BR, EA). TANZANIA. **Bukoba:** Minziro Forest Res., Kalagara-Bikunyu Subvillage, *L. Festo 1807* (US); Rwasina [= Ruasina] to Kiziba, *J. Ford 493* (K). UGANDA. **Bunyoro:** Murchison Falls Nat. Park, Murchison Falls, *R. B. Faden, A. Evans & K. Lye in R. B. Faden 69/1060* (EA); 23 mi. [37 km] N of Butiaba turnoff on Butiaba–Murchison Falls Nat. Park rd., 6 mi. [10 km] N of Sambiye River crossing, near Kisansya, *R. B. Faden, A. Evans & K. Lye in R. B. Faden 69/1067* (EA) [also grown at Smithsonian Institution, pressed as *D. M. Cameron 02/07* (US)]. **Kigezi:** Queen Elizabeth Nat.

Park (just outside), South Maramagambo Central Forest Res., 1 mi. [1.6 km] up rd. Kaizi–Bitereko off the Katunguru–Ishasha rd. (Congo Rd.), *R. B. Faden, A. Evans & K. Lye in R. B. Faden 69/1095* (EA). **Masaka:** ca. 6 mi. [10 km] Masaka–Bukakata rd., *C. H. S. Kabuye & T. Mayanja 294* (EA, K); Buddu County, Lake Kaganja, E side, *K. Lye 2620* (EA). **Mengo:** Bavum County, Victoria Islands, near Kitamiro, *H. C. Dawkins D406* (EA); Entebbe, *T. D. Muellands 186* (K); Site 362, 8.29 mi. [13.34 km] W of Lwampanga, *I. Langdale-Brown 2178* (K). **Mubende:** Wattuba, Singo County, *A. B. Katende k95* (K); 10 km NW of Katera, *K. Lye 2329* (K). **Toro:** Queen Elizabeth Nat. Park, *J. M. Lock 68/257* (EA); Ruwenzori, *F. Scott Elliot 7813A* (K). **District Unknown:** sin loc., *R. Dümmer 2630* (BM, K).

The collections *Faden & Faden 71/834* and *Kindeketa et al. 114* are unusually large for *Cyanotis repens* subsp. *repens*. *Faden & Faden 71/834* has the longest and broadest leaves (to 5.2 cm long and 1.8 cm wide in different leaves) and the longest and broadest sheaths (to 7 mm long and 6.5 mm wide pressed) for this subspecies. It also has up to 3-flowered, instead of the usual 1- or 2-flowered, inflorescences. The capsule matches the longest seen in any other collection of subspecies *repens* (3.5 mm long), but the seeds (1.15–1.35 mm) fall in the overlap between those of the two subspecies. If this plant were from the range of subspecies *robusta*, there is no doubt that we would have identified it as such. *Faden & Faden 71/834* was collected in *Acacia* thorny deciduous bushland on sandy soil (in sched.), a habitat drier than most other collections of subspecies *repens*, but that ecological difference seems insufficient to account for its size and robustness. Unfortunately, no living material was gathered at the time of the collection, so the ploidy cannot be determined. Thus the assignment of this collection to subspecies *repens* is tentative. *Kindeketa et al. 114* has leaf sheaths to 6 mm long and 5 mm wide (pressed) and the lamina to 3.3 cm long, but we think it is just a robust specimen of subspecies *repens*.

The collection *Lind 345* from Uganda, which we have treated as subspecies *repens* based on its morphology, is geographically remote from the other collections of this subspecies (Fig. 2). It also comes from a much higher elevation (1980 m) than any other specimen of this subspecies. *Lind 345* is outside the range of subspecies *robusta*, too, although it is much closer geographically to that subspecies than to other collections of subspecies *repens*.

The single collection from Gabon, *Baudon 108*, is from the capital Libréville, so perhaps it was from cultivation. It is far from the nearest collection of *Cyanotis repens* but, considering the frequency of subspecies *robusta* in western Democratic Republic of Congo (Fig. 2), an extension of its confirmed range further west and north would not be surprising.

Cyanotis repens has been known as a distinct entity for a long time and has been variously cited in the literature. *Cyanotis repens* subsp. *repens* has been called *Cyanotis* sp. A in Faden and Suda (1980) and *Cyanotis* sp. nov. in Robertson and Luke (1993). *Cyanotis repens* subsp. *robusta* has been cited as *Cyanotis* sp. B in Faden and Suda (1980), *Cyanotis* sp. 1 in *Flore du Rwanda Spermatophytes* (Malaise, 1988), and *Cyanotis* sp. A in *Upland Kenya Wild Flowers* (Faden, 1994).

Cyanotis repens belongs to a group of species that may be called the Cyanotis foecunda species group. This group is characterized by the presence of only sessile to subsessile inflorescences, a glabrous style and, insofar as is known, a basic chromosome number of $x = 13$. The C. foecunda group is mainly African, ranging from the Arabian Peninsula to South Africa and Madagascar and extending into Central and West Africa. The species comprising this group, in addition to *C. repens*, are: *C. nyctitropa* Deflers of the Arabian Peninsula, *C. somaliensis* C. B. Clarke of northern Somalia, *C. foecunda* Hasskarl, which ranges from Ethiopia west to Cameroon and south to Mozambique, Zimbabwe, Botswana, and Namibia, *C. speciosa* (L. f.) Hasskarl, which is distributed from Tanzania and Democratic Republic of Congo to South Africa and in Madagascar, *C. lapidosa* E. Phillips of South Africa, and probably *C. robusta* Obermeyer of South Africa and *C. hepperi* Brenan of Nigeria and perhaps Cameroon. *Cyanotis flexuosa* C. B. Clarke from Angola, if it proves distinct from *C. foecunda*, would also belong to this group. It is noteworthy that aside from the three relatively widespread taxa, *C. foecunda*, *C. repens*, and *C. speciosa*, the species in this group tend to be local and allopatric.

Cyanotis repens appears to be most closely related to *C. foecunda*, the only species in this group with whose range it overlaps. The two species have long been confused, especially from herbarium specimens, because they both may have flowering shoots with numerous sessile, axillary cincinni and both may form mats, at least in Kenya and Tanzania. In addition, they both have similar karyotypes (a basic number of $x = 13$ and all chromosomes with subterminal centromeres) (Faden & Suda, 1980). The major differences are that *C. repens* always forms mats (whereas *C. foecunda* only sometimes forms mats), plants lack a definite base (vs. having a definite base), plants lack corms (or bulbs) (vs. sometimes having them), the flowering shoots have indeterminate growth, i.e., an inflorescence does not terminate the shoot (vs. determinate

growth, with an inflorescence always terminating the shoot), the leaves or foliaceous bracts that subtend the individual cincinni do not decrease in size distally (vs. strongly decreasing distally), the terminal style swelling is fusiform with a relatively broad stigma (vs. obpyriform with a very narrow stigma), and the plants may be polyploid or diploid (vs. strictly diploid).

Cyanotis repens has also been confused with *C. somaliensis*. Indeed, a plant received from the Missouri Botanical Garden many years ago as *C. somaliensis* (*Cameron 02/08*, US) has proven to be *C. repens* subsp. *robusta*. However, other plants cultivated as *C. somaliensis*, particularly by succulent enthusiasts, e.g., Brewerton (1977) and Keen (1982), have basal rosettes and are clearly not *C. repens*. Whether they are true *C. somaliensis*, which has rarely been collected in the field, or some other species is yet to be established. True *C. somaliensis*, which was reinvestigated by the senior author at Kew in 2003, including a study of liquid-preserved flowers, differs from *C. repens* in having the flowering shoots arising from a sterile basal rosette, flowering shoots with determinate growth, with up to 7 (vs. numerous) cincinni per shoot, with the leaves of the flowering shoot distally decrescent, and an obpyriform style swelling with a very narrow stigma. The karyotype of *C. somaliensis* is also distinct from that of *C. repens* (Faden & Suda, 1980; Jones & Kukkonen, 1971) (see below).

Cyanotis somaliensis has also been confused with *C. foecunda*. Indeed, the plant used to illustrate *C. somaliensis* in Faden (1995) proved to be a white-pubescent plant of *C. foecunda* from xeric conditions in eastern Kenya (*Faden & Faden 77/576*, US).

Cyanotis nyctitropa from the Arabian Peninsula differs from *C. repens* in the same features as *C. somaliensis*. In addition, it has thick, almost tuberous roots, instead of the fibrous roots found in *C. repens*, *C. foecunda*, and *C. somaliensis*.

A final plant that has to be contrasted with *Cyanotis repens* is *C. somaliensis* var. *uda* C. B. Clarke, which was described from western Democratic Republic of Congo. It is poorly understood and is known for certain only from the type (*Gillet 2140*; holotype, BR; photos K, US). The vegetative shoots closely resemble *C. repens* subsp. *robusta*, but the flowering shoots are determinate (i.e., the shoots are terminated by inflorescences), the individual cymes are more elongate (up to 2 cm long) and many-flowered, and the bracteoles are larger and more falcate. It may be just an odd specimen of *C. repens* subsp. *robusta*, within whose range it occurs, or a taxon closely related to this subspecies. The type, *Gillet 2140*, resembles certain mat-forming specimens of *C. foecunda*, e.g., *Cameron 02/09* (ex *Faden 69/1304*) from southwestern Kenya, but the bracts subtending the individual cincinni in the former are neither reflexed nor strongly reduced distally, as they are in *C. foecunda*, and the elongate cincinni also are not present in *C. foecunda*. The determination of specimens such as *Cameron 02/09* as *C. foecunda* is based on their inflorescences, style swelling, and diploid chromosome count that are identical to other specimens of *C. foecunda*. Thus *Cyanotis somaliensis* var. *uda* is not *C. foecunda*, but its relationship to *C. repens* remains unclear. Moreover, *Cyanotis somaliensis* var. *uda* shows no close resemblance to *C. somaliensis*. Clarke's notes on the type of *C. somaliensis* var. *uda* indicate that he thought it differed from the typical variety only by its longer and weaker stems that were possibly due to its growing in a moister habitat. The elongate cymes of variety *uda* and its lack of a basal rosette are important differences from *C. somaliensis*, and there is little likelihood of a close relationship between these taxa.

Faden and Suda (1980) found variation in ploidy within *Cyanotis repens*. A population of *Cyanotis repens* subsp. *repens* (as *Cyanotis* sp. A) from the Coast Province in Kenya (*Faden & Faden 74/1174*) was diploid, with a mitotic count of $2n = 26$ (Faden & Suda, 1980, fig. 18—voucher slides for chromosome counts in the Department of Botany, Smithsonian Institution), whereas a population of *C. repens* subsp. *robusta* (as *Cyanotis* sp. B) from Uganda (*Faden, Evans & Lye in Faden 69/1067*) was hexaploid ($2n = 78$) (figs. 21, 22). Subsequent counts from three further collections of *C. repens* subsp. *repens*, all from Kenya's Coast Province (*A. Faden 8/82*; *Faden & Beentje 85/68*; and *Taita Hills Expedition 742*), were also $2n = 26$ (Faden, unpublished). In contrast, a collection of *C. repens* subsp. *robusta* from Masai Mara National Park in southwestern Kenya (*A. Faden 4/79*) had $2n = 52$ chromosomes and was tetraploid (Faden, unpublished). Thus *C. repens* subsp. *repens* appears to be consistently diploid, whereas *C. repens* subsp. *robusta* is polyploid, either tetraploid or hexaploid.

Karyotypes appear to be important in characterizing and suggesting relationships among the species of the C. foecunda group. The karyotype of *Cyanotis repens* is unusual for the genus and for the C. foecunda group in lacking metacentric chromosomes. All chromosomes in both subspecies have subterminal centromeres (Faden & Suda, 1980). Within the C. foecunda group this karyotype is otherwise known only from *C. foecunda*, which is always diploid ($n = 13$, $2n = 26$), whereas *C. repens*

can be diploid, tetraploid, or hexaploid (Faden, unpublished; Faden & Suda, 1980; Lewis, 1964).

At least some metacentric or submetacentric chromosomes are present in all other species of the C. foecunda group that have been investigated: five pairs of metacentrics and eight pairs of subterminals in *C. somaliensis* (Jones & Kukkonen, 1971); at least two pairs of metacentrics among the 13 chromosome pairs in *C. nyctitropa* (Faden & Suda, 1980); and six pairs of submetacentrics and seven pairs of subterminals in *C. speciosa* (Jones & Kukkonen, 1971). All of these species have been recorded only as diploids. Some variation in basic chromosome number in *C. speciosa* was reported by Lewis (1964).

Within *Cyanotis*, besides the C. foecunda group, only *Cyanotis villosa* (Sprengel) Schultes f. and the closely related *C. racemosa* Hasskarl, both of India and Sri Lanka, are known to have a basic chromosome number of $x = 13$ (Bai et al., 1995; Faden, unpublished; Jones & Kukkonen, 1971). Bai et al. (1995) have shown convincingly that *C. villosa* has $x = 12$, as well as $x = 13$, in India, and both basic numbers have been found in *C. racemosa* from Sri Lanka (Faden, unpublished). Plants of both species frequently have some pedunculate inflorescences. Thus the morphological and cytological characters of the Indian species are different from those of the C. foecunda group. A clear relationship between these two species groups is yet to be demonstrated.

Cyanotis repens subsp. *robusta* was observed in cultivation in Kenya for the first time in 2003. Flowering material was collected at the Naro Moru River Lodge west of Mt. Kenya (*Faden & Faden 2003/001*, US, EA). Additional plantings were observed but not collected on the grounds of the National Museums of Kenya, Nairobi.

Acknowledgments. The participation of the junior author in this project was part of the 2002 Research Training program at the National Museum of Natural History, Smithsonian Institution. This research was supported by a grant from the National Science Foundation Research Experiences for Undergraduates program, Award Number DBI-9820303. We thank Stanley Yankowski for assistance in the laboratory, Dan Cole for help with the distribution map, and Alice Tangerini for the drawings of the specimen.

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Three New Species of *Schefflera* (Araliaceae) from the Espinhaço Range in Minas Gerais, Brazil

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ABSTRACT. Three new species of *Schefflera* from the Espinhaço Range in Minas Gerais, Brazil, are described and illustrated: *Schefflera botumirimensis* Fiaschi & Pirani resembles *S. glaziovii* (Taubert) Frodin & Fiaschi, but differs by its elongated inflorescence and leaflet morphology. *Schefflera fruticosa* Fiaschi & Pirani appears to be related to *S. vinosa* (Chamisso & Schlechtendal) Frodin & Fiaschi, but can be distinguished by its reduced inflorescence with up to five partial inflorescences at each primary branch. *Schefflera villosissima* Fiaschi & Pirani is similar to *S. macrocarpa* (Chamisso & Schlechtendal) Frodin, but differs by its more dense indumentum and the flowers grouped in heads.

RESUMO. Três espécies novas de *Schefflera* da Cadeia do Espinhaço em Minas Gerais, Brasil, são descritas e ilustradas: *Schefflera botumirimensis* Fiaschi & Pirani assemelha-se a *S. glaziovii* (Taubert) Frodin & Fiaschi, no entanto difere desta pela inflorescência alongada e a morfologia dos folíolos. *Schefflera fruticosa* Fiaschi & Pirani parece relacionada a *S. vinosa* (Chamisso & Schlechtendal) Frodin & Fiaschi, mas pode ser distinta pelas inflorescências reduzidas com até 5 inflorescências parciais por ramo primário. *Schefflera villosissima* Fiaschi & Pirani assemelha-se a *S. macrocarpa* (Chamisso & Schlechtendal) Frodin, diferindo pelo indumento mais denso e as flores agrupadas em capítulos.

Key words: Araliaceae, Brazil, Espinhaço Range, Minas Gerais, *Schefflera*.

The genus *Schefflera* J. R. Forster & G. Forster includes ca. 900 species and is thus the largest in the family Araliaceae (Frodin, 1995; Frodin & Govaerts, 2003). It is widely distributed in tropical areas, where it is best represented at high altitudes in southeastern Asia, New Caledonia, and the mountain ranges of the Andes.

The current delimitation of pantropical *Schefflera* has been shown to be highly unnatural and to include four to five independent lineages; one of these independent lineages comprises the Neotropical species (Wen et al., 2001; Plunkett et al., 2004). In Brazil, the genus is represented by ca. 50 species, most of which are restricted to small areas in the Guayana Shield (near the border with Venezuela), the Atlantic Coastal forests of Rio de Janeiro and Espírito Santo states, western Amazonia, and the Central Plateau, with the highest percentage of locally endemic species occurring along the Espinhaço Range in Minas Gerais.

During a taxonomic study of *Schefflera* in southeastern Brazil (Fiaschi, 2002), several new species have been recognized. As with most Brazilian species of *Schefflera* that were previously included in *Didymopanax* Decaisne & Planchon (essentially distinct by its bicarpellate ovary), the new species described here belong to this group.

These species are from the Espinhaço Range in Minas Gerais, being "endemic to only one mountain," a distributional pattern described by Giulietti and Pirani (1988) that is characteristic of many species of the *campos rupestres* vegetation. Descriptions of this special type of vegetation are found in Harley (1995) and Giulietti et al. (1997).

Schefflera botumirimensis Fiaschi & Pirani, sp. nov. TYPE: Brazil. Minas Gerais: Botumirim, contrafortes orientais da Serra da Canastra, trilha do Cruzeiro, 1280 m, 29 Sep. 1997 (fr), *R. Mello Silva, M. L. Kawasaki & A. Rapini 1475* (holotype, SPF; isotypes, BHCB, K, MO, NY). Figure 1.

Species nova a *Schefflera glaziovii* inflorescentia elongata, pedicellis fructuum longioribus (1–2 cm longo), basibus foliolorum rotundatis differt.

Shrubs up to ca. 2 m tall; branchlets 4–8 mm diam., grayish-sericeous or glabrescent, nigrescent when dried. Leaves crowded at the terminal portion of branchlets; stipules 4–6 mm long, apex generally bifid; petiole 13–23 cm long, glabrescent; leaflets 7 to 11, deflexed, conduplicate, papery, glabrous on adaxial surface, grayish-sericeous or glabrescent on abaxial surface; venation brochidodromous; main vein prominent on both surfaces, more so

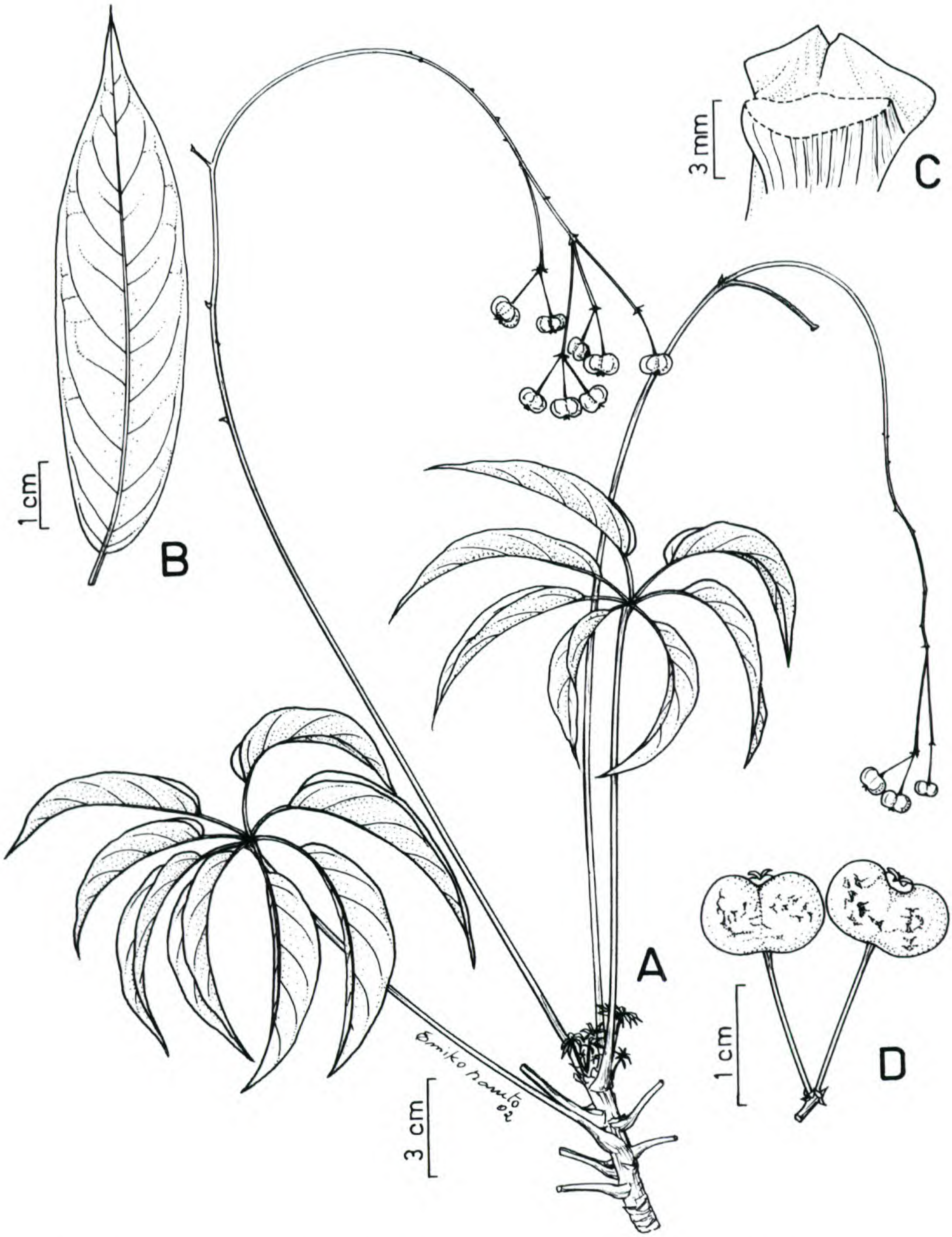

Figure 1. *Schefflera botumirimensis* Fiaschi & Pirani. —A. Fruiting branch. —B. Median leaflet. —C. Adaxial view of the stipule. —D. Fruits. Drawings based on the type.

abaxially; secondary veins 7 to 9, impressed on both surfaces; intersecondary veins absent. Median leaflet: petiolule 1.5–2 cm long, canaliculate on adaxial surface, glabrescent; blade 5.8–8.6 × 1–2.7 cm, narrowly elliptic or oblong to ovate, apex caudate, base rounded (subcordate), margin entire, slightly revolute; basal leaflets with petiolule up to ca. 1 cm long, these blades 5–7 × 1–1.8 cm, sim-

ilar in shape to the median ones, symmetric or slightly asymmetric. Inflorescence terminal, glabrescent; peduncle up to ca. 3.5 cm long, rachis absent or up to ca. 8.5 cm long; primary branches 3 or 4, 21.5–34 cm long; secondary branches 7 to 9, 4–15 cm long; tertiary branches up to ca. 3.5 cm long; ultimate inflorescence units umbellate; floral bracts ca. 0.5 mm long. Flowers not seen. Drupe laterally compressed, 4.5–7 × 8.5–10 mm; pedicel 1–2 cm long; styles 2(3); pyrenes 2(3), 6–7.5 × 4.5–5.0 mm, indurate.

Schefflera botumirimensis is probably endemic to the Serra da Canastra and appears to be restricted to an area northwest of the municipality of Botumirim in the northern portion of the Espinhaço Range. Its restricted geographic range and the knowledge of just one collection from an unprotected area suggests that this species should be considered critically endangered (IUCN, 2001).

Schefflera botumirimensis resembles *S. glaziovii*, differing clearly by its elongated inflorescence and pedicels (1–2 cm long in fruit) and by the morphology of the leaflets, which are characterized by rounded bases, in sharp contrast with those of *S. glaziovii*, which have cuneate to obtuse bases.

Schefflera botumirimensis, along with *S. gardneri* and *S. glaziovii*, comprises a group of shrubby species characteristic of rocky outcrops of *campos rupestres* vegetation along the Espinhaço Range in the Brazilian state of Minas Gerais. This species group is characterized by the presence of leaflets with the blade slightly to strongly conduplicate and the apex acute to caudate or cuspidate.

Schefflera fruticosa Fiaschi & Pirani, sp. nov. TYPE: Brazil. Minas Gerais: Jaboticatubas, Parque Nacional da Serra do Cipó, morro do lado esquerdo da Cachoeira da Farofa, 15 June 2000 (fl, fr), *P. Fiaschi & F. N. Costa 286* (holotype, SPF; isotypes, BHCB, K, MBM, MO, NY, RB, SP). Figure 2.

Species nova a *Schefflera vinosa* inflorescentia brevi pauciflora (usque ad 5 ramulis per ramum primarium), foliolis medianis angustioribus (3.5–11 cm longis, 0.7–2.7 cm latis).

Shrubs 1–1.5 m tall; branchlets 3–5 mm diam., densely ochraceous-yellowish to grayish-sericeous to glabrescent; internodes up to ca. 2.5 cm long. Stipules reduced (ca. 3 mm long), apex entire or slightly bifid; petiole 3–13 cm long, ascendent, glabrescent, slightly striate longitudinally; leaflets (1)3 to 8, ascendent, plane, papery, glabrous on adaxial surface, ochraceous-yellowish to grayish-sericeous to glabrescent on abaxial surface; venation brochidodromous; main vein prominent on both surfaces, more so abaxially; secondary veins 6 to 9, prominent only abaxially; intersecondary veins absent. Median leaflet with petiolule 1–2.5 cm long, subwinged; blade 3.5–11 × 0.7–2.7 cm, narrowly oblanceolate, apex acute to rounded (truncate), mucronate, base narrowly cuneate to long-attenuate, margin entire, revolute; basal leaflets with petiolule up to ca. 0.6 cm long, blade 2.2–7 × 0.5–1.3 cm, gradually shorter than the median, symmetric to clearly asymmetric. Inflorescence terminal, erect, included within the foliage, ochraceous-yellowish to grayish-sericeous to glabrescent; peduncle up to ca. 0.5 cm long, rachis absent or up to ca. 5.5 cm long; primary branches (2)3 to 7, all but 1(2) of which are terminal, 2.5–8.5(13) cm long; secondary branches 1 to 5, 0.3–5.5 cm long, bracts 2–3 mm long; ultimate inflorescence units umbellate, with 7 to 18 flowers; floral bracts ca. 1 mm long, triangular. Pedicel 0.4–1 cm long; calyx ochraceous to yellowish-sericeous, lacinia evident; petal color cream-greenish, ca. 3 × 1.5 mm, elliptic, sericeous abaxially, glabrous adaxially; filaments ca. 0.7 mm long, anthers 1.8–2 × 0.8–1 mm, oblong and apiculate; styles 2, free, ascending in flower, reflexed in fruit. Drupe laterally compressed, 6–7.2 × 10–11.5 mm, glabrous, green when immature, turning dark purple at maturity; pedicel 5–8 mm long; pyrenes (1)2(3), 5.5–8 × 4.5–6 mm, indurate.

Schefflera fruticosa is presumably endemic to the Serra do Cipó, in the southern Espinhaço Range, where it is found between rock outcrops in shallow soil fields. It has been collected with flowers in February and June and with fruits in June and September.

Several features, both vegetative and reproductive, can be used to distinguish *Schefflera fruticosa* from other members of the genus in eastern Brazil, the most remarkable being the reduced and few-flowered inflorescences and the very narrow, ascendent leaflets. The inflorescences of *Schefflera fruticosa* bear both bisexual and male flowers, the first ones essentially on the distal part of the branches and the others more proximally, thus characterizing an andromonoecious sexual system.

The specific epithet refers to this plant's shrubby habit, a common feature among woody species endemic to the *campos rupestres* of the Espinhaço Range.

Paratypes. BRAZIL. **Minas Gerais:** Jaboticatubas, Alto da Serra da Lagoa Dourada, *N. Roque et al. 104* (CTES, F, G, R, SPF, UEC); morro do lado esq. da Cachoeira da Farofa, *P. Fiaschi et al. 68* (SPF, U); entrada do Canyon das Bandeirinhas, *P. Fiaschi et al. 61* (SPF); Santana do Riacho, estrada vicinal da Rodovia MG 010, trilha

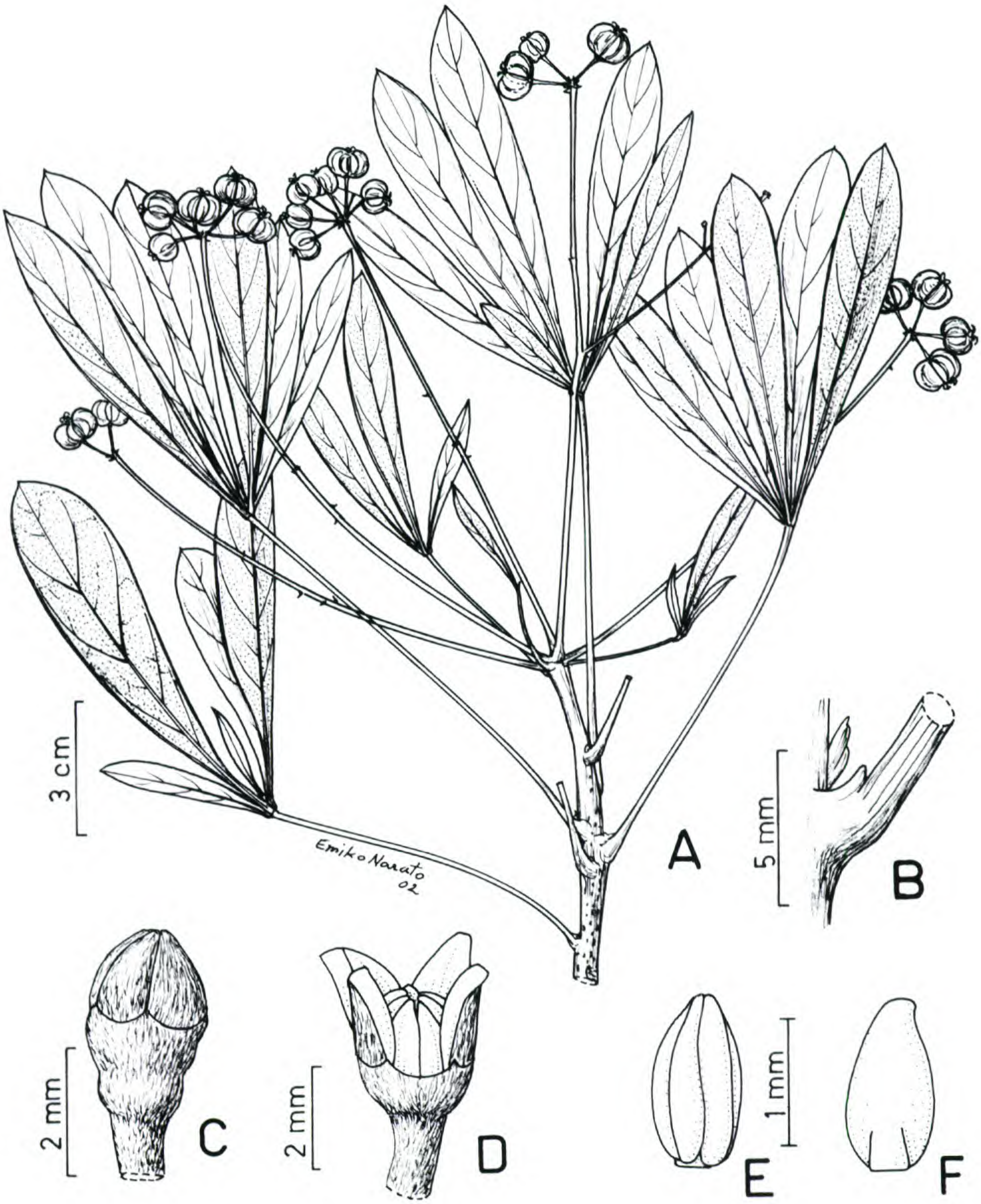

Figure 2. *Schefflera fruticosa* Fiaschi & Pirani. —A. Fruiting branch. —B. Lateral view of stipule. —C. Floral bud. —D. Flower (one petal removed). —E. Adaxial view of the stamen. —F. Abaxial view of the stamen. Drawings based on the type (A, C–F) and *N. Roque et al. 104* (B).

para Cachoeira do Gavião, *P. Fiaschi & F. N. Costa 348* (HUEFS, K, SPF, UB).

Schefflera villosissima Fiaschi & Pirani, sp. nov. TYPE: Brazil. Minas Gerais: Serra do Espinhaço, at Lapinha, ca. 19 km N of Serro, on road (MG 2) to Diamantina, ca. 1200 m, 24 Feb. 1968 (fl), *H. S. Irwin, H. Maxwell & D. C. Wasshausen 20809* (holotype, K; isotypes, NY, UB, photo SPF). Figure 3.

Species nova a *Schefflera macrocarpa* indumento denso villoso, floribus in capitulis congestis differt.

Shrubs to 4 m tall; branchlets densely ochraceous to yellowish-villous. Leaves crowded at the terminal portion of the branchlets; stipules ca. 1 cm long, entire; petiole 20–23 cm long, cylindrical, densely ochraceous to yellowish to grayish-villous; leaflets 7 to 9, horizontal, plane, leathery, the adaxial surface with trichomes restricted to the prox-

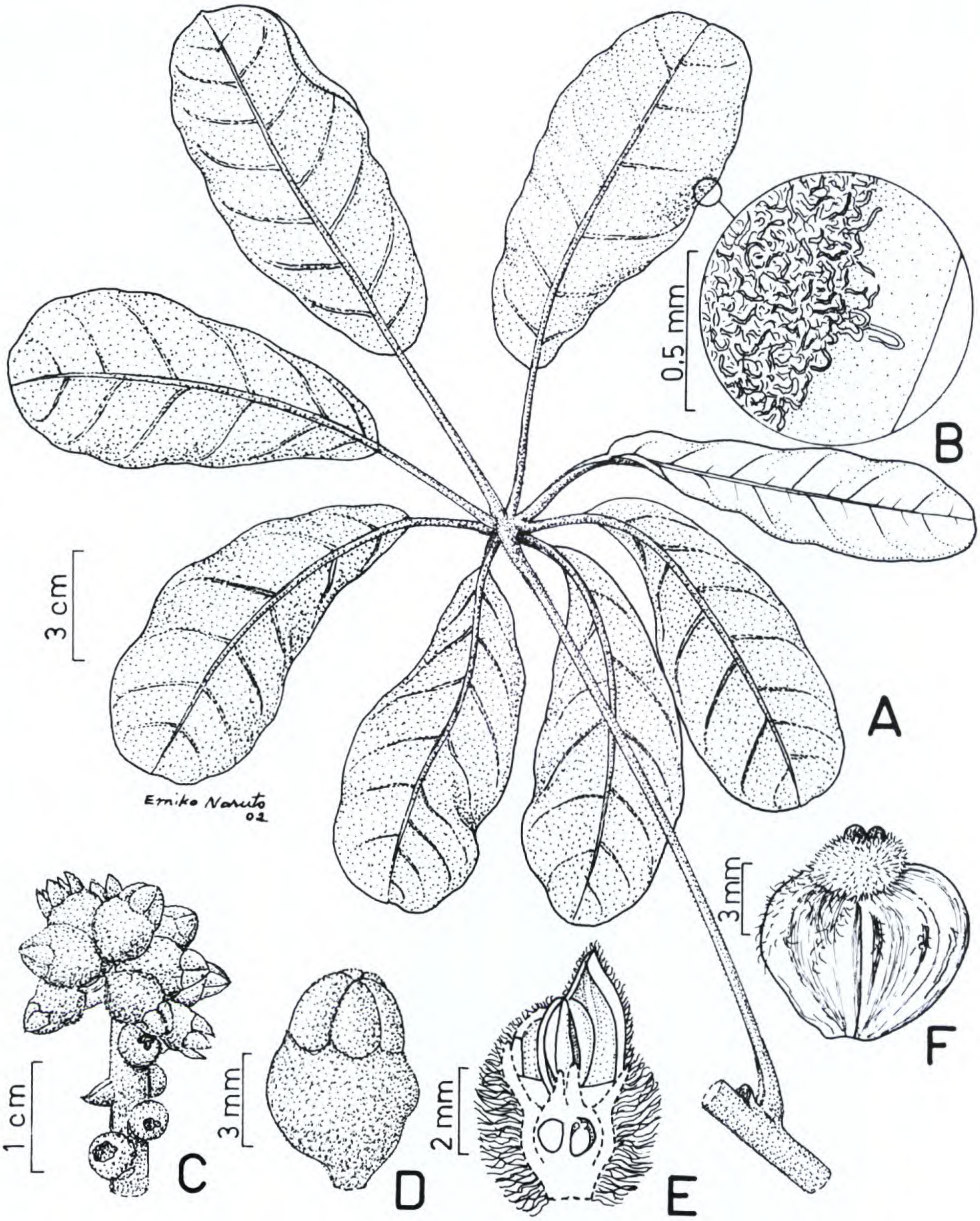

Figure 3. *Schefflera villosissima* Fiaschi & Pirani. —A. Leaf. —B. Detail of the indument on the abaxial surface of leaflet. —C. Ultimate inflorescence unit. —D. Floral bud. —E. Longitudinal section of the floral bud. —F. Fruit. Drawings based on *R. Mello-Silva et al. CFCR 7870* (A, B), *H. Irwin et al. 20809* (C–E), and *W. R. Anderson 8736* (F).

imal portion of the main vein, abaxial surface densely ochraceous to yellowish-villous; venation brochidodromous; main vein prominent on both surfaces, more so abaxially; secondary veins 10 to 12, prominent abaxially, but impressed adaxially; intersecondary veins absent. Median leaflet with petiolule 3–5.5 cm long, laterally compressed, densely villous; blade 12–12.5 × 7–8 cm, elliptic or oblong, apex retuse to rounded, base obtuse to rounded, margin entire, revolute; basal leaflets with petiolule up to 0.5–1.5 cm long, blade 8.5–9 × 2.5–4 cm, similar to median ones. Inflorescence terminal, erect, densely ochraceous to yellowish-villous; peduncle ca. 1 cm long, rachis reduced; primary branches 6, 15–43 cm long, secondary branches 25 to 41, 2.5–7 cm long, with only one terminal to 10 racemosely arranged capitulate ultimate inflorescence units; floral bracts ca. 1.5 mm

long, triangular. Flowers sessile, densely ochraceous to yellowish-villous; calyx villous, lacinia evident; petals 2.5–3.7 × 1.3–2.1 mm, ovate or elliptic, apex acute, glabrous adaxially, tomentose abaxially; filaments 0.3 mm long; anthers 2.2–2.4 × 1.1–1.2 mm wide, oblong, apiculate; styles 2(3), free, ascending in flower, reflexed in fruit. Drupe laterally compressed, 6–7 × 9–11 mm, persistently villous at apex, with two pyrenes.

The new species is endemic to mountains of the Diamantina Plateau in the Espinhaço Range. It has been collected with flowers in August and February, and with fruits in January, February, April, and July.

As commonly found in most Brazilian *Schefflera*, the inflorescences of *S. villosissima* have both bisexual and male flowers, being thus characterized as having an andromonoecious sexual system.

Schefflera villosissima closely resembles *S. macrocarpa*, differing from it by having flowers grouped in heads (vs. ultimate inflorescence units umbellate) and the dense villous indumentum that covers the undersurface of leaflets and petiolules, as well as the flowers and inflorescences (vs. indumentum not so dense).

Although one collection (*Martius s.n.*, M) bears the name *Didymopanax macrocarpum* var. *villosissimum* [ined.], written in E. Marchal's handwriting, this name was never published. We have decided to retain the varietal epithet since it fits well with the material described here. As the diagnostic features cited above are well marked in populations from the Diamantina Plateau, we thought it better to recognize *Schefflera villosissima* as a distinct species rather than as a variety of *S. macrocarpa*.

Paratypes. BRAZIL. **Minas Gerais:** without precise locality, *C. F. P. Martius s.n.* (M); Couto de Magalhães de Minas, 5 km by road NE of Rio Manso & Couto de Magalhães, 960–1000 m, *W. R. Anderson 8736* (UB); Diamantina, Serra do Mourão, *G. Hatschbach 40869* (MBM); diamond district, *G. Gardner 4706* (BM); Felisberto Caldeira [= São Gonçalo do Rio Preto], Curtidor, *G. Hatschbach & L. Z. Ahumada 31681* (MBM); Rio Vermelho, Pedra Menina, Serra do Ambrósio, Espigão do Meio, *R. Mello-Silva et al. CFCR 7870* (SPF).

Acknowledgments. The authors are grateful to Emiko Naruto for the inking of the illustrations, to the anonymous reviewers, and to FAPESP (Fundação de Amparo à Pesquisa do Estado de São Paulo) and the Margaret Mee Botanical Foundation for financial support to the first author.

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Validation of a New Species of *Schwartzia* (Marcgraviaceae) and Synopsis of the Genus for Ecuador

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ABSTRACT. A new species of *Schwartzia*, *S. pterosara*, is validated. This species is known only from the vicinity of Baeza, Napo Province, Ecuador. A key to and a synopsis of the Ecuadorean species of *Schwartzia* are provided. Four *Schwartzia* species are presently recognized from Ecuador, with *S. chocoensis* and *S. diaz-piedrahitae* as first records for the country.

RESUMEN. Se valida una nueva especie de *Schwartzia*, *S. pterosara*. La nueva especie se conoce únicamente de los alrededores de Baeza en la Provincia de Napo (Ecuador). Se presentan una clave y una sinopsis para las especies ecuatorianas de *Schwartzia*. Así, *Schwartzia* está representado en Ecuador por cuatro especies, siendo registradas por primera vez para el país *S. chocoensis* y *S. diaz-piedrahitae*.

Key words: Ecuador, Marcgraviaceae, *Norantea*, *Schwartzia*.

Schwartzia Vellozo is a small genus of the Neotropical family Marcgraviaceae comprising 17 species distributed in wet lowland forests or montane rain and cloud forests from Costa Rica to southern Brazil, and also in the Lesser Antilles. This genus is easily distinguished from *Norantea* Aublet and other related genera [*Marcgraviastrum* (Wittmack ex Szyszylowicz) de Roon & S. Dressler and *Sarcopera* Bedell, which constitute the Norantea complex] by its relatively short raceme with flowers that are borne on long pedicels, and by the stalked cymbiform, cyathiform or helmet-shaped nectaries that are attached at or below the middle of the pedicel, or only rarely at the base of the pedicel, e.g., *S. diaz-piedrahitae* Giraldo-Cañas. The flowers in *Schwartzia* are larger than those found in *Norantea*. A key to the four genera of the Norantea complex was provided in Giraldo-Cañas (2003).

A thorough taxonomic treatment of the Norantea complex was the unpublished Ph.D. thesis of Bedell (1985). Additional research on the group has been carried out by de Roon and Dressler (1997) and Giraldo-Cañas (2001a, 2001b, 2001c, 2002a, 2002b, 2002c, 2003). *Schwartzia pterosara*, a new species proposed by de Roon and Bedell (Bedell, 1985) is validated here. The description, Latin diagnosis, and taxonomic history are based on Bedell (1985), with some changes made herein.

Schwartzia pterosara de Roon & Bedell ex Giraldo-Cañas, sp. nov. TYPE: Ecuador. Napo: along rd. betw. Quito & Baeza, 3 mi. W of Baeza, 0°25′S, 77°51′W, 2000 m, 2 Oct. 1980, *T. B. Croat 50284* (holotype, MO; isotypes, GH, MARY not seen). Figure 1.

Frutex. Folia obovata (5–)8–12.5 cm longa et (2.2–)3.8–6.2 cm lata basibus acutis apicibus obtusis; glandes hypophyllae 50–68 in quoque folio in aequalibus seriebus 1–11 mm distantibus ex marginibus foliorum. Axes inflorescentiarum 10–17.2 cm longi; flores 18–42; pedicelli 3.5–5.5 cm longi et 2–3 mm lati basin versus 4–5 mm lati apicem versus; nectaria cyathiformia, 0.6–1.0 cm longa, 0.8–1.6 cm ex basibus pedicellorum inserta; stamina 12; ovarium 5-loculatum; stigma mammiforme.

Sprawling epiphytic shrubs; branches woody and subterete with glabrous, grayish yellow bark and longitudinal lenticels. Leaves petiolate and coriaceous, dull green above, reddish brown below, producing a non-ciliate fracture when broken perpendicular to the midvein; petioles 3–6 × 2–3 mm; lamina obovate, (5–)8–12.5 × (2.2–)3.8–6.2 cm, base acute to cuneate, apex obtuse, mucronate or occasionally retuse through the loss of the mucron with 50 to 68 small- to medium-sized hypophyllous glands per lamina in 2 ± uniform rows located 1–11 mm from the margin; midvein obscure or impressed above, prominulous below, lateral veins obscure on both surfaces or prominulous below. Inflorescence a dense, multiflorous, broom-like raceme, axis 10–17.2 cm long, with 18 to 42 flowers borne on slender, tapered pedicels 3.5–5.5 cm long, 2–3 mm wide basally, thickening to 4–5 mm apically, attached to rachis at angles of 45°–85°; foliaceous bracts ovate, 1.4–2.1 × 0.9–1.2 cm, each with 3 pairs of hypophyllous glands; nectariferous bracts leathery and somewhat succulent, greenish red, cyathiform, 0.6–1 × 0.6–0.8 cm on attenuate stalks

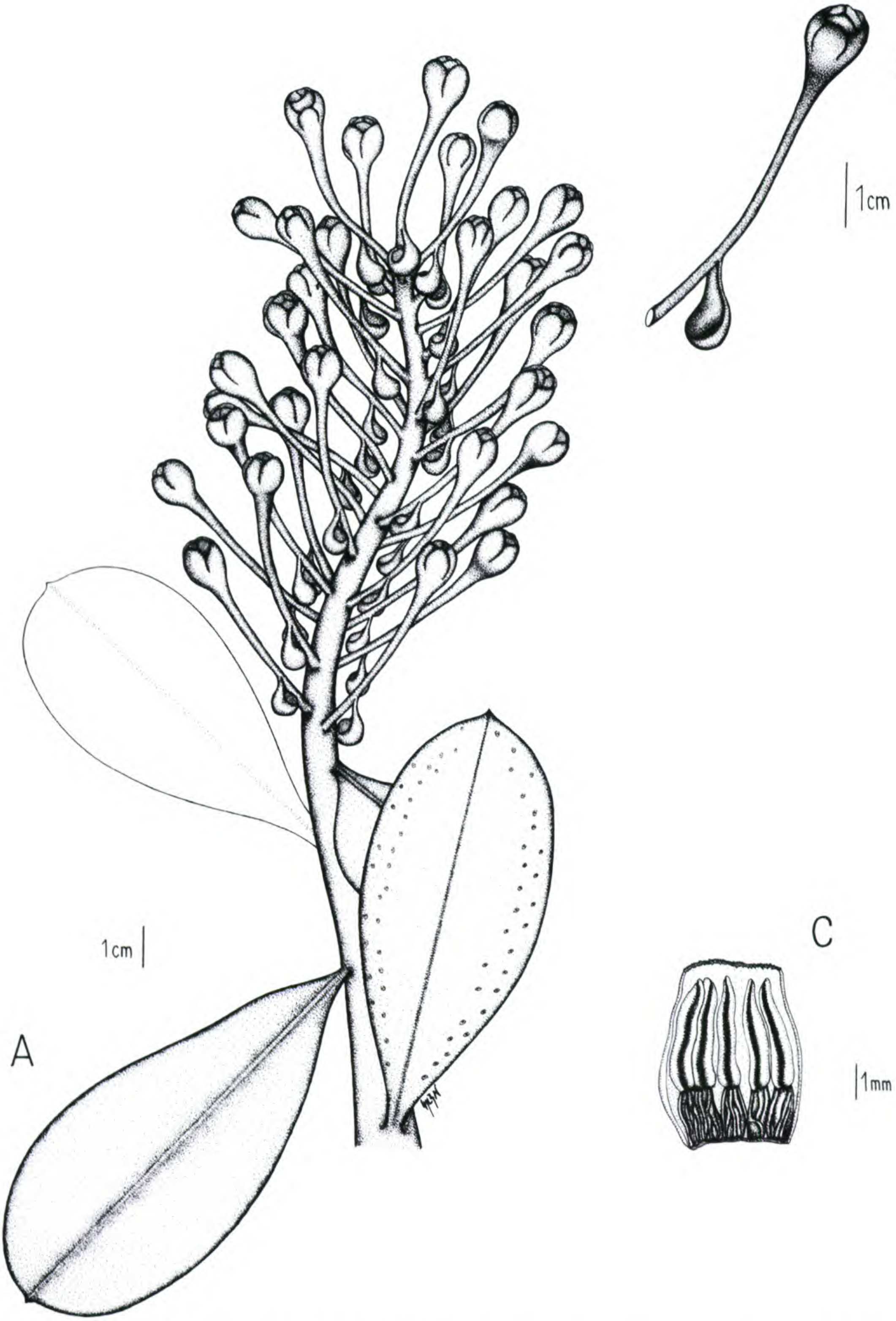

Figure 1. *Schwartzia pterosara* de Roon & Bedell ex Giraldo-Cañas. —A. Floriferous branch. —B. Bud and nectariferous bract. —C. Part of corolla with attached immature stamens (from *Croat 50284*, holotype, MO).

3–4 mm long, attached 0.8–1.6 cm from the base of pedicels. Flowers pale green with red at maturity; buds 0.6–0.9 cm long; bracteoles elliptic to obovate with membranaceous margins, (4–)8–11 × (4–)7–9 mm, tightly appressed to the calyx; sepals orbicular with membranaceous margins, (4–)5–7 mm long and wide; petals free, elliptic to oblanceolate, 8–11 × 3–5 mm; stamens 12, 6–8 mm long; filaments free, flattened and broader apically, adnate basally to the corolla; anthers subsaggitate, pollen bright yellow; ovary pyriform or turbinate, 4–5 mm tall, 5-locular; style cylindrical, 1 mm tall; stigma smooth, mammiform. Fruit 0.9–1.1 × 0.8–1 cm, globose, apiculate, green or brown; seeds reniform to elliptic, reticulate, shiny, numerous, 1.2–1.5 × ca. 0.7 mm.

Distribution and habitat. *Schwartzia pterosara* is known only from wet Andean forests at 2000 m in the vicinity of Baeza (Napo, Ecuador). However, there may be more specimens at other herbaria from Ecuador (e.g., QCA, QCNE, GUAY), but unfortunately I do not have access to their collections. It is hoped that increased collecting activity will yield additional specimens of this species.

Bedell (1985) cited another collection from Colombia [*Cuatrecasas 23618* (F, US)], but I have not seen it, despite the Curators of F and US sending me all their Marcgraviaceae collections (with the exception of vouchers belonging to *Marcgravia*) deposited in these herbaria. Stefan Dressler (FR, pers. comm.) said there is one specimen from Peru at FR and MO (*Campos & Núñez 4612*), but I have not seen this collection either. If these collections belong to *S. pterosara*, the distribution of the species is broader than stated above.

Phenology. Flowering September to October; fruiting June to July.

Etymology. The epithet *pterosara* is composed by the Greek words *pteron*, feather, and *saron*, broom, referring to the feathery, broom-like appearance of the inflorescence.

Schwartzia pterosara differs from the other species of the genus by its large number of hypophyllous glands, its dense, multiflorous raceme, tapered pedicels, and the size and shape of the nectaries. With these new species, four *Schwartzia* species are presently recognized for Ecuador (*S. chocoensis* Giraldo-Cañas, *S. diaz-piedrahitae*, *S. lozaniana* Giraldo-Cañas, and *S. pterosara*).

Paratype. ECUADOR. **Napo:** vic. Baeza, 2000 m, *L. Besse, H. Kennedy & R. Baker 1504* (MO).

A Synopsis of the Genus *Schwartzia* in Ecuador

Schwartzia Vellozo, Fl. Flumin. 5: 221. 1825 [1829]. TYPE: *Schwartzia glabra* Vell. [= *Schwartzia brasiliensis* (Choisy) Bedell ex Giraldo-Cañas].

Sprawling terrestrial or epi- to hemiepiphytic shrubs. Leaves spiraled, subsessile or petiolate, blades glabrous, oblong, elliptic, or obovate, occasionally asymmetrical, venation brochidodromous, obscure or impressed above, obscure to prominent beneath, coriaceous, with hypophyllous glands. Inflorescence racemose, terminal, rarely lateral, multiflorous or occasionally pauciflorous; flowers pentamerous, borne on elongate pedicels, subtended by the stalked sacciform, tubular, cymbiform, cyathiform, or helmet-shaped nectaries that are attached at or below the middle of the pedicel, or only rarely at the base of the pedicel (e.g., *S. diaz-piedrahitae*); sepals 5, imbricate in 2 whorls; petals 5, free or basally connate, reflexed at anthesis; stamens 10 to numerous, rarely 5, in 1 or several whorls; filaments linear to broad and somewhat flattened, free or basally connate and occasionally adnate to base of petals; anthers basifixed to subbasifixed, subcordate or subsagittate; ovary conical, pyriform, or turbinate, completely or incompletely 3- to 5-locular; stigma mammiform, subsessile, lobed or radiate. Fruit capsular, globose to subglobose, apiculate with persistent style and stigma, loculicidally and septifragously dehiscent from the base; seeds hemispherical or reniform, reticulate, few to numerous, and with a shiny black testa.

Vellozo (1825) described the genus *Schwartzia* based on a single species, *S. glabra*, a small tree of the coastal forests of Brazil characterized by having slightly evaginated nectariferous bracts inserted at or near the middle of the pedicel. This tree proved to be the previously described *Norantea brasiliensis* Choisy (1824). *Schwartzia* was soon placed in synonymy, and its species referred to *N. brasiliensis* [= *S. brasiliensis* (Choisy) Bedell ex Giraldo-Cañas]. Delpino (1869), however, noted the distinctive bract position and proposed a monotypic subgenus, *Norantea* subg. *Cochliophyllum*, for *N. brasiliensis*. More recently, the genus *Schwartzia* was revived by Bedell (1989) and recognized by de Roon and Dressler (1997) when they accepted the segregation of the Norantea complex in four genera (*Marcgraviastrum*, *Norantea*, *Sarcopera*, and *Schwartzia*).

KEY TO THE ECUADOREAN SPECIES OF *SCHWARTZIA*

1a. Nectariferous bracts cyathiform, 0.6–1 cm long; 50 to 68 hypophyllous glands per lamina; bracteoles (4–)8–11 mm long; sepals (4–)5–7 mm long; petals 8–11 mm long . . . . . *S. pterosara*
1b. Nectariferous bracts saccate, tubularifom to globose, 0.9–3.3 cm long; 0 to 14 hypophyllous glands per lamina; bracteoles 1.8–5 mm long; sepals 2–7 mm long; petals 5–13 mm long.
2a. Nectariferous bracts attached at the base of the pedicel; stamens 14 . . . *S. diaz-piedrahitae*
2b. Nectariferous bracts attached 1–1.6 cm from the base of the pedicel; stamens 22 to 50.
3a. Stamens 22 to 26; bracteoles ca. 2 mm long; sepals 2.2–2.8 mm long; ovary ca. 2.5 mm long; ovary 4-locular; urn of the nectariferous bracts 0.9–1.7 cm long . . . . . *S. lozaniana*
3b. Stamens 50; bracteoles 2.5–5 mm long; sepals 4–7 mm long; ovary 3–8 mm long; ovary 5-locular; urn of the nectariferous bracts 1.5–3.3 cm long . . . . . *S. chocoensis*

1. Schwartzia chocoensis Giraldo-Cañas, Revista Acad. Colomb. Ci. Exact. 25: 478. 2001. TYPE: Colombia. Chocó: carr. Ansermanuevo–San José del Palmar, 8.4 km del Alto del Galápago, 1600 m, 19 Feb. 1977, *E. Forero, A. Gentry, A. Sugden & D. Daly 3000* (holotype, COL; isotypes, CHOCO, MO).

Description and illustration: Bedell (1985: 202–206, as "Schwartzia foreroi" de Roon & Bedell, *nomen nudum*); Giraldo-Cañas (2003: 10–12).

Schwartzia chocoensis is easily recognized by its large flowers on long and thick pedicels, with succulent, saccate or tubularifom nectaries, and by its long leaves. This species was known only from the Chocó region of Colombia (Bedell, 1985: 203–206; Giraldo-Cañas, 2003: 12). Recent studies of the Norantea complex have revealed its occurrence in one locality in Pichincha Province, Ecuador. The study of specimens from Colombia and Ecuador leaves no doubt about their identity. *Schwartzia chocoensis* occurs as a sprawling shrub in different types of wet forests below 1600 m. "Schwartzia foreroi" de Roon & Bedell is a *nomen nudum* that appears in Bedell (1985: 202) and in Forero and Gentry (1989: 103); it is synonymous of *S. chocoensis.*

Additional specimens examined. ECUADOR. **Pichincha:** km 110 Quito-Nono-Tandayapa-Mindo-Puerto Quito, *C. Dodson & A. Embree 13091* (MO).

2. Schwartzia diaz-piedrahitae Giraldo-Cañas, Revista Acad. Colomb. Ci. Exact. 25: 480. 2001. TYPE: Colombia. Valle del Cauca: Bajo Calima, Concesión Pulpapel/Buenaventura, 3°55′N–77°W, 100 m, 17 Oct. 1984, *M. Monsalve 484* (holotype, COL; isotypes, JAUM, MO, NY).

Description and illustration: Bedell (1985: 168–172, as "Schwartzia colombiana" de Roon & Bedell, *nomen nudum*); Giraldo-Cañas (2003: 12–14).

This species is unusual by having its nectariferous bracts attached at the base of the pedicel, a feature unique within the genus *Schwartzia. Schwartzia diaz-piedrahitae* was known only from the Chocó region in Colombia (Bedell, 1985: 169–170; Giraldo-Cañas, 2003: 13). However, recent studies of Colombian and Ecuadorean specimens have confirmed its presence at one locality in the province of Carchi, Ecuador. This species is a common and sometimes abundant element of wet lowland forests at 0–450 m. "Schwartzia colombiana" de Roon & Bedell is a *nomen nudum* that appears in Bedell (1985: 168) and in Forero and Gentry (1989: 103); it is synonymous with *S. diaz-piedrahitae.*

Additional specimens examined. ECUADOR. **Carchi:** trail along plain above Tobar-Donoso & Río Guape, *W. Hoover 1254* (MO).

3. Schwartzia lozaniana Giraldo-Cañas, Caldasia 23: 384. 2001. TYPE: Colombia. Nariño: Junín–Tumaco rd., 6–11 km W of Junín, roadside thickets & forest edge, 850–1030 m, 27 Feb. 1979, *J. Luteyn & M. Lebrón-Luteyn 6880* (holotype, COL; isotypes, MO, NY, U not seen).

Description and illustration: Bedell (1985: 198–201, as "Schwartzia venusta" de Roon & Bedell, *nomen nudum*); Giraldo-Cañas (2003: 15–17).

Schwartzia lozaniana is easily recognized by its flowers borne on long and slender pedicels, its saccate nectaries, and its elliptic-obovate to oblong leaves with acuminate to attenuate apices. This species has been recorded in Nariño (southern Colombia) and Esmeraldas (Ecuador) (Giraldo-Cañas, 2001b, 2003) and now, too, in the province of Carchi (Ecuador). *Schwartzia lozaniana* is uncommon in Colombia and Ecuador, and its occurrence is limited to some wet montane forests at 400–1600 m.

Additional specimens examined. ECUADOR. **Carchi:** trail to Río Gualpi Chico, along ridge line near Awa encampment, *W. Hoover et al. 2538* (MO); border area betw. Carchi & Esmeraldas, ca. 20 km past Lita on rd. Lita–Alto Tambo, *H. van der Werff et al. 11992* (MO). **Esmeraldas:** Quinindé Cantón, Bilsa Biol. Stat., Res. Ecol. Mache-Chindul, 40 km NW of Quinindé, Loma de los Guerrilleros, *J. Clark et al. 3974* (COL); Lita–San Lorenzo rd., 18 km W of Río Lita Bridge, on old rd. below Lita, 6.6 km W of bridge over Río Chuchubí, *T. Croat et al.*

82631 (MO); Lita–San Lorenzo rd., 10–20 km NW of Lita, *A. Gentry et al. 70088* (MO).

4. Schwartzia pterosara de Roon & Bedell ex Giraldo-Cañas.

Acknowledgments. I thank Rosa Ortiz-Gentry (MO), Victoria Hollowell (MO), Olga Martha Montiel (MO), Diana Gunter (MO), Rodrigo Bernal (COL), Carlos Parra (COL), and Enrique Forero (COL) for valuable help, and Stefan Dressler (FR) and Álvaro Idárraga (HUA) for providing important references. The curators of following herbaria are acknowledged for the loan of specimens: CHOCO, COAH, COL, CR, CUVC, F, HUA, IBGE, JAUM, MEDEL, MEXU, MO, MPU, NY, PSO, RSA, SI, SP, UIS, US, and VEN. Visits to MO and RSA were financed by the Universidad Nacional de Colombia (Bogotá), Missouri Botanical Garden (St. Louis, Missouri), and Rancho Santa Ana Botanic Garden (Claremont, California). Dubán Canal (COL) provided the illustration of *S. pterosara*. I thank two anonymous reviewers for their critique of the manuscript. This paper is derived from the project "Estudios sistemáticos en el complejo *Norantea* Aubl. (Marcgraviaceae)," project No. 803765 of the "División de Investigación (DIB) de la Universidad Nacional de Colombia," Bogotá.

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Belamcanda Included in *Iris*, and the New Combination *I. domestica* (Iridaceae: Irideae)

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ABSTRACT. The eastern Asian genus *Belamcanda* (Iridaceae: Irideae), with its sole species, *B. chinensis*, the leopard or blackberry lily, has long been understood to be most closely related to *Iris dichotoma* (syn. *Pardanthopsis dichotoma*), but has nevertheless been maintained as a separate genus because of its distinctive floral, fruit, and seed morphology. Molecular DNA sequence evidence shows *B. chinensis* and its sister species, *I. dichotoma*, to be nested within the large Northern Hemisphere genus *Iris* (ca. 280 spp.). Not only does consistent taxonomic treatment of genera of the Iridaceae require that *Belamcanda* be transferred to *Iris*, but we argue that taxonomy should follow the principle of monophyly, which requires that *Belamcanda* and any other genus nested in *Iris* be treated as members of that genus. A new combination, *I. domestica* (basionym *Epidendrum domesticum*), is made for *B. chinensis* (based on *Ixia chinensis*), because the name *Iris chinensis* is preoccupied. The names *Belamcanda pampaninii* Léveillé and *B. chinensis* var. *taiwanensis* S. S. Ying are here included in the synonymy of *I. domestica*.

Key words: *Belamcanda*, Iridaceae, Iridoideae, *Iris*, paraphyly, phylogeny.

The genus *Belamcanda* Adanson, now usually regarded as comprising a single species, *B. chinensis* (L.) DC., the leopard or blackberry lily (Mathew, 1981), is a member of the predominantly Old World tribe Irideae of subfamily Iridoideae of the Iridaceae (Goldblatt, 1990). The tribe includes the Northern Hemisphere genus *Iris* L. (ca. 280 spp.) of Eurasia, North America, and North Africa, the largely sub-Saharan African *Moraea* Miller (ca. 196 spp.), the southern African *Bobartia* L. (15 spp.), *Dietes* Salisbury ex Klatt (6 spp.), which is largely sub-Saharan African but has one species on Lord Howe Island in the southern Pacific region, and the tropical and southern African *Ferraria* Burman ex Miller (ca. 12 spp.). Other small, formerly recognized, largely African genera, including *Barnardiella* Goldblatt (1 sp.), *Galaxia* Thunberg (15 spp.), *Gynandriris* Parlatore (9 spp.), *Hexaglottis* Ventenat (6 spp.), and *Homeria* Ventenat (32 sp.), found to be nested in *Moraea*, have been reduced, rendering *Moraea* monophyletic (Goldblatt, 1998; Goldblatt et al., 2002).

In contrast, the small genera clearly allied to, and evidently nested in, *Iris*, including *Belamcanda*, *Hermodactylus* Miller (1 sp.), and *Pardanthopsis* (Hance) L. W. Lenz (1 sp.), are usually recognized in floristic accounts. Thus *Iris*, according to current circumscriptions, is paraphyletic. The belief that these genera are most closely related to particular species or species groups within *Iris* has now been confirmed by molecular study using chloroplast DNA regions (Tillie et al., 2001). A consistent treatment of genera of the Iridaceae requires that the names of these genera be treated as synonyms of *Iris*, and, we argue, a taxonomy that follows the phylogenetic principle of taxonomic monophyly demands such treatment. That *Belamcanda chinensis* is nested in *Iris* is not only amply demonstrated by molecular analysis using two chloroplast DNA sequences (Tillie et al., 2001), but it is also the most parsimonious interpretation of evidence from more classical characters. Its basic morphology closely resembles that of *Iris* (*Pardanthopsis*) *dichotoma* Pallas in its aerial, suberect rhizome that is in effect a stem, the more or less dichotomously branched inflorescence, and short subequal dark green spathes enclosing the flowers of each inflorescence unit (a rhipidium) (Mathew, 1981). Both species have indeed been referred to the genus *Pardanthus* Ker Gawler. In addition, both species are fully deciduous, unlike most other, though by no means all, *Iris* species. These two species share the same, apparently derived, chro-

mosome number, $2n = 32$, and karyotype, and, despite their apparently grossly different flowers, can readily be crossed. Neither species can be crossed with any other species of *Iris* tested (Simonet, 1934). Morphological similarity combined with the biosystematic data led Lenz (1972) to segregate *I. dichotoma* as the monotypic genus *Pardanthopsis*, named for its similarity to *Pardanthus*, a nomenclatural synonym of *Belamcanda* (Ker Gawler, 1804). The "intergeneric" hybrids between *Belamcanda* and *Pardanthopsis* have been named ×*Pardacanda* Lenz, for obvious reasons.

The segregation of *Pardanthopsis* from *Iris* overlooks its similarities to some species of *Iris*, including *I. japonica* Thunberg and other far eastern *Iris* species that have an aerial rhizome. Tillie et al.'s (2001) molecular analysis places *I.* (*Pardanthopsis*) *dichotoma* sister to *Belamcanda chinensis* with strong bootstrap support (BS 98%), but there is only moderate support for the nesting of these two species within a well-supported clade that comprises subgenus *Iris*, a western Asian and European assemblage. Nevertheless, both *Belamcanda* and *Pardanthopsis* are deeply nested in *Iris*, and we see no reasonable alternative to including both in that genus.

While the single species each of *Hermodactylus* and *Pardanthopsis* were originally, and are occasionally still, included in *Iris*, as *I. tuberosa* L. and *I. dichotoma*, respectively, *Belamcanda* has never been so treated. Thus there is no available combination in *Iris* for *B. chinensis*. We remedy this here, and formally place *Belamcanda* in the synonymy of *Iris*. According to Garay (1997), the earliest specific epithet available for transfer to *Iris* is provided by *Epidendrum domesticum* L., and the new combination *Iris domestica* is therefore provided here. The specific epithet from *Belamcanda chinensis*, based on *Ixia chinensis* L., cannot be transferred to *Iris* because of the name *I. chinensis* Curtis, a synonym of *I. japonica* Thunberg, another eastern Asian species.

Systematics

Iris L., Sp. Pl. 38. 1753. TYPE: *Iris* ×*germanica* L. (pro sp.).

Belamcanda Adanson, Fam. Pl. 2: 60 (as "*Belam-Canda*") & 524 (as "*Belamkanda*"). 1763, nom. et orth. cons. Syn. nov. TYPE: *Belamcanda chinensis* (L.) DC., typ. cons.

Pardanthus Ker Gawler, Koenig & Sims Ann. Bot. 1: 246. 1804, nom. illegit. superfl. pro *Belamcanda*. TYPE: *Pardanthus chinensis* (L.) Ker Gawler.

Iris domestica (L.) Goldblatt & Mabberley, comb. nov. Basionym: *Epidendrum domesticum* L., Sp. Pl. 2: 952. 1753. *Vanilla domestica* (L.) Druce, Bot. Exch. Club Soc. Brit. Isles 3: 425. 1913. TYPE: Kaempfer, Amoen. Exot. Fasc. 5: t. 869, fig. 1 [Angurèk Warnà]. 1712, based on material given to Kaempfer by "Nic. Moellerus" in Jakarta ["Batavia"], Java, Indonesia (icon, lectotype, designated by Garay (1997)). EPITYPE: [Europe, cultivated,] *E. Davall* in Herb. J. E. Smith 89.42 (bequeathed to Smith in 1798)–LINN-SM 45, fiche seen, designated here).

Ixia chinensis L., Sp. Pl. 36. 1753. *Belamcanda punctata* Moench, Methodus 529. 1794, nom illegit. superfl. pro *Ixia chinensis* L. *Moraea chinensis* (L.) Thunberg, Fl. Jap. 34 1784. *Belamcanda chinensis* (L.) DC., in Redouté, Liliac. 3: ad t. 121. 1805. *Pardanthus chinensis* (L.) Ker Gawler, Koenig & Sims Ann. Bot. 1: 247. 1804, nom. illegit. superfl. pro *Belamcanda chinensis* [*Pardanthus sinensis* Van Houtte, Fl. Serres Jard. Eur. 26: t. 1632. 1865–67. orthog. var.]. *Gemmingia chinensis* (L.) Kuntze, Revis. Gen. Pl. 2: 701. 1891. comb. illeg., gen. inval. TYPE [icon]: Rheede, Hort. Malab. 11: t. 37. 1692 (lectotype, designated here).

Belamcanda pampaninii Léveillé, Repert. Spec. Nov. Regni Veg. 8: 59. 1910. TYPE: China. Guizhou: Shuiyang Xian, Wangcaoba [28°12′N, 107°26′E] or Wang-ts'ao-pa [28°08′N, ca. 107°12′E] (as Kouy-Tcheou, Choui-mi-tsin, Hoang-Tsao-Pa), flowers yellow, June 1909, *Esquirol 1565* (holotype, E).

Belamcanda chinensis var. *taiwanensis* S. S. Ying, Col. Illustrated Plants of Taiwan 1: 237. 1980. TYPE: Taiwan Keelung, Hopingtao, Aug. 1979, *S. S. Ying s.n.* (HAST not seen).

The type of *Epidendrum domesticum* is a somewhat stylized illustration in Kaempfer (1712), whose description is apparently based on two completely different plants (Garay, 1997), one an orchid, probably a *Cymbidium* species, and *Belamcanda chinensis*. In Kaempfer's account of Japanese plants it is one of the plants collected in 17th century Java by one "Nic. Moellerus," though, remarkably, unmentioned in the compendium of van Steenis-Kruseman (1950), and given to Kaempfer who was on the island in 1689–1690 and 1692–1693. It was then included in Linnaeus's *Species Plantarum*, where it received its first acceptable name. The plant was described by Kaempfer as a scandent parasite with variegated six-petaled flowers. The illustration, however, shows no indication of a climbing habit: only the upper portion of a branched flowering stem is drawn, with stalked multi-flowered inflorescences rather crudely shown. The flowers have six mottled tepals, five of them subequal and one irregularly twisted into what

could be mistaken for an orchid labellum. Stamens and details of the style are not shown. Although no confirmatory ("typotype") specimen could be found by DJM in Kaempfer's collection in the Sloane Herbarium (BM; cf. also Hinz, 2001), we agree with Garay that the illustration is a flowering stalk of *Belamcanda* with the individual rhipidia bearing two flowers raised above the characteristically short spathes. In interpreting the mixed illustration thus, Garay was able to avoid upsetting orchid nomenclature and, at the time when *Belamcanda* was considered distinct from *Iris*, this action had no effect on the iridaceous element. Here we provide an epitype as (ICBN Art. 9.7; Greuter et al., 2000) an "interpretative type [as] the lectotype . . . associated with a validly published name, is demonstrably ambiguous." We have chosen an early cultivated collection from Europe, as we have been unable to find a suitable early sheet from Java where Moellerus gathered his material for Kaempfer.

The genus *Belamcanda* was named in 1763 by Adanson, who did not transfer *Ixia chinensis*, the single species that he cited, to the genus. That action was left to De Candolle who provided the combination in 1805. That same year John Ker Gawler assigned *I. chinensis* to his new genus *Pardanthus*, evidently unaware that this name was a later synonym of *Belamcanda*. *Gemmingia*, a genus listed in indices of plant names as another synonym of *Belamcanda*, is as far as we can determine invalid, lacking a description. The name was used by Fabricius (1763), who attributed the name to Heister, but we have not yet been able to find mention of the genus in Heister's publications. Because it is evidently invalid, we have not listed *Gemmingia* in the synonymy above. Two species were listed by Fabricius as referable to *Gemmingia*, both listed as polynomials in the genus *Ixia*. Currently these are *Iris domestica* and *Aristea africana* (L.) Hoffmansegg, the basionym of which is *Ixia africana* (Linnaeus, 1753). Kuntze (1891) provided the combination *G. chinensis*, which is illegitmate because *Gemmingia* is invalid. Of the works containing illustrations of the plant cited in the protologue of *Ixia chinensis* we choose the illustration in Rheede's *Hortus Malabaricus* as the lectotype, as best representing the species. The specimen of the species in the Linnaean Herbarium is not available as a lectotype because it was added to the collection after Linneaus's death.

Indexes of plant names list *Iris tripedalis* Fischer ex Roemer & Schultes as a synonym of *Belamcanda chinensis*, but it is an invalid authorless name, mentioned in discussion only, in the *Mantissa* to volume 1 of Roemer & Schultes's *Systema vegetabilium* under the account of *I. dichotoma* (Roemer & Schultes, 1822: 306). The unlisted name *Pardanthus tricolor* Arruda ex Almeida (1873: 273) was based on material grown in Brazil but no type is known, making its identity uncertain, although this plant is very likely *I. domestica*. We are indebted to Joseph Kirkbride for drawing our attention to this name. We assume that *Belamcanda flabellata*, described by C. H. Grey in 1934 for yellow-flowered plants believed to have come from Japan, is a color variant of *Iris domestica*, but we have been unable to locate type material and do not include this name in synonymy. The yellow-flowered variety *B. chinensis* var. *taiwanensis* was included in *B. chinensis* by Zhao et al. (2000), a treatment we endorse. Although we have not seen the type, C.-I. Peng (pers. comm.) considers it a trivial variant of *I. domestica* (*B. chinensis*) with slightly smaller flowers than variety *chinensis*, which is also native in Taiwan. At least one other heterotypic synonym is known for the species. *Belamcanda pampaninii* (Léveillé, 1910; McKean, 1986), described by Hector Léveillé, is based on (apparently) wild-collected plants from China, also with predominantly yellow flowers.

All other names in *Belamcanda* and *Pardanthus* (Moench, 1794) found in standard indexes of plant names are combinations in those genera for South African species now included in *Sparaxis* Ker Gawler or *Tritonia* Ker Gawler. *Pardanthus dichotomus* (Pallas) Ledebour is *I. dichotoma*, while *P. nepalensis* Sweet, a name without description, may be *B. chinensis*.

Iris domestica is believed to be native to eastern China, Japan, Korea, Taiwan, and the Ussuri region of Russia (Mathew, 1981), but the plant has been in cultivation for so long a time, persists where planted, and spreads so readily from gardens, that its original distribution remains somewhat uncertain. It is treated in the *Flora of China* as native there, and is listed as also occurring in Japan, Korea, Myanmar, Vietnam, India, the Philippines, and Russia, but the authors did not differentiate its native from introduced localities (Zhao et al., 2000) and noted that the plant is "usually cultivated." Indeed, the name *Belamcanda* is perhaps a corruption of a southwest Indian vernacular name (Nicolson et al., 1988: 294).

The distinctive features of *Iris domestica* are the subequal, spreading tepals, weakly differentiated into limb and claw (unlike other *Iris* species), and the bizarre tepal coloration, a light pink to orange base with speckles of orange to scarlet pigmentation (Fig. 1). Even more singular are the free tepals, while the style base is not embedded in hypanthi-

Figure 1. *Iris domestica*, flowering branch, stem base with leaves, ripe capsule, and detail of the style and style branches, each with abaxial stigma lobes and short, suberect vestigial paired crests; style branch details much enlarged. Scale bar 1 cm. Drawn by John Manning from plants cultivated at the Missouri Botanical Garden.

um tissue and the style is divided into narrow, almost filiform branches, the latter seemingly quite different from the broad, tangentially flattened, usually petal-like style branches of *Iris* that terminate in paired petal-like crests. Examination (with a 10× hand lens), however, shows that the style branches are *Iris*-like in miniature (Fig. 1). The stigma is a small abaxial lobe below the apex of each style branch, while two small flaps of sterile tissue form crest-like appendages at the adaxial apices of the style branch. This structure seems best interpreted as homologous with the more prominent style branches of other *Iris* species. The apparent reduction of the *Iris*-like style branches in *I. domestica* is paralleled in several species of the related African genus *Moraea*, notably species in section *Homeria* (Goldblatt, 1986, 1998). In *Moraea* the reduction of the style branches is associated with a shift in pollination system (Goldblatt & Bernhardt, 1999). A shift in pollination system therefore seems likely in *I. domestica*.

Iris domestica also differs from other *Iris* species in its globose, smooth, shiny back seeds (Fig. 1), evidently an apomorphic character state. The seeds are quite different from those of other *Iris* species, including *I. dichotoma*, and leave us marveling at their unusual structure, which we suggest is an adaptation to avian dispersal, for the seeds collectively remain attached to the axile placentas after the capsule walls have dried and curved outward, the infructescence thereby resembling a blackberry. This is reflected in one of its common names, blackberry lily, a name used in North America where it is widely naturalized (Goldblatt, 2002).

Acknowledgments. We thank Mary Stiffler, librarian at the Missouri Botanical Garden, for providing copies of literature needed for this study, David Boufford, Brian Mathew, Ching-I Peng, and Peter H. Raven for helpful comments on the biology and geography of *Belamcanda*, Joseph Kirkbride for pointing out Almeida Pinto's publication, Charlie Jarvis for help with Linnaean typification, Stans Kofman for information on early Javanese collections, and Roy Gereau for nomenclatural advice and the examination of Heister's publications.

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A New *Anthurium* sect. *Pachyneurium* (Araceae) from Minas Gerais State, Brazil

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ABSTRACT. A new species, *Anthurium leonii* E. G. Gonçalves from Minas Gerais State in southeastern Brazil, is described, illustrated, and compared with *A. solitarium* Schott, the most similar species. *Anthurium leonii* belongs to section *Pachyneurium* Schott series *Pachyneurium* (Schott) Croat and seems to occur only above 1100 m elevation in the Caparaó National Park. This new species is so far known from the type locality and surrounding areas.

RESUMO. Uma nova espécie de *Anthurium* (*A. leonii* E. G. Gonçalves), proveniente do estado de Minas Gerais, sudeste do Brasil, é descrita, ilustrada e comparada com *A. solitarium* Schott, a espécie mais similar. *Anthurium leonii* pertence à seção *Pachyneurium* Schott, série *Pachyneurium* (Schott) Croat e parece apenas ocorrer em altitudes acima de 1100 m, no Parque Nacional do Caparaó. Até onde se conhece, esta espécie é apenas conhecida para a localidade típica e áreas vizinhas.

Key words: *Anthurium*, Araceae, Brazil, section *Pachyneurium*.

The genus *Anthurium* Schott, comprising approximately 1000 species (Croat, 1999), is exclusively Neotropical and is the largest genus in the family Araceae. Section *Pachyneurium* is the only section completely revised in recent times (Croat, 1991), with at least 115 species, including *A. xanthophylloides* G. M. Barroso, added after the publication of the revision (Gonçalves & Salviani, 2001). The diagnostic feature for this section is the presence of involute vernation, which is supervolute in the other sections (Croat, 1991). The species of section *Pachyneurium* are usually large herbs with short internodes.

During my first visit to the herbarium Guido Pabst (GJFP) in October 2000, I made note of a specimen of *Anthurium* from Caparaó National Park, originally identified as *A. solitarium* Schott. Its observed morphology consistently varied from the typical *A. solitarium* that usually occurs in the eastern Brazilian states of Minas Gerais, Espírito Santo, and Rio de Janeiro. Later, I observed living plants of this species in the field and have concluded it is a new species, here described. Descriptive terminology follows Croat and Bunting (1979), and the term metaphyll for the second cataphyll follows Grayum (1986).

Anthurium leonii E. G. Gonçalves, sp. nov. TYPE: Brazil. [Minas Gerais:] Alto Caparaó, Parque Nacional do Caparaó, 1300 m, 26 Oct. 1996, *L. S. Leoni 3500* (holotype, GFJP; isotype, UB). Figure 1.

Ad sectionem *Pachyneurium* seriem *Pachyneurium* pertinens. Planta epilithica; internodia brevia, 4–7 cm diam.; prophyllum trigonum, 2-carinatum; metaphyllum lanceolatum non carinatum; petiolus 6–13 cm longus, 0.7–1.5 mm diam., U-formatus, adaxiale sulcatus, marginibus rotundatis; lamina coriacea, obovata, 46–58 cm longa, 21.5–32 cm lata, nervis primariis lateralibus 10–15 utroque, arcuatis; pedunculus 30–46 cm longus, 0.5–0.7 cm diam.; spatha lanceolata vel ovato-lanceolata, 11–17 cm longa, 1.8–2.5 cm lata, marginibus ad basem obtusis sed abrupte acute decurrentibus; spadix castaneus, 9.5–25 cm longus, inferne 7–11 mm diam., sursum attenuatus.

Epilithic; stem with internodes short, 4–7 cm diam.; roots numerous, dense, green, smooth; cataphylls dimorphic, prophyll elongate-triangular, 6–9 cm long, clearly 2-keeled, metaphyll lanceolate, 12–16 cm long, non-keeled, acute at apex, both persisting as long brown fibers. Leaves erect to spreading; petiole 6–13 cm long, 0.7–1.5 cm diam., U-shaped, narrowly sulcate with rounded margins adaxially, rounded abaxially, the surface dark green, pale-speckled; geniculum slightly thicker than the petiole, pale green, 0.5–1.5 cm long; sheath 5.2–9 cm long; blade coriaceous, 46–58 cm long, 21.5–32 cm wide, obovate, rounded at apex with a small mucron up to 2 mm long at apex, obtuse to rounded at base, broadest at the middle or slightly above, the margins very weakly undulate; upper surface matte, medium green, lower surface matte, slightly paler; both surfaces drying matte, yellowish green to yellow-brown; midrib slightly prominent above, obtusely raised below; primary lateral veins 10 to 15 per side, departing midrib at 40°–50° angle, arcuate, slightly raised in

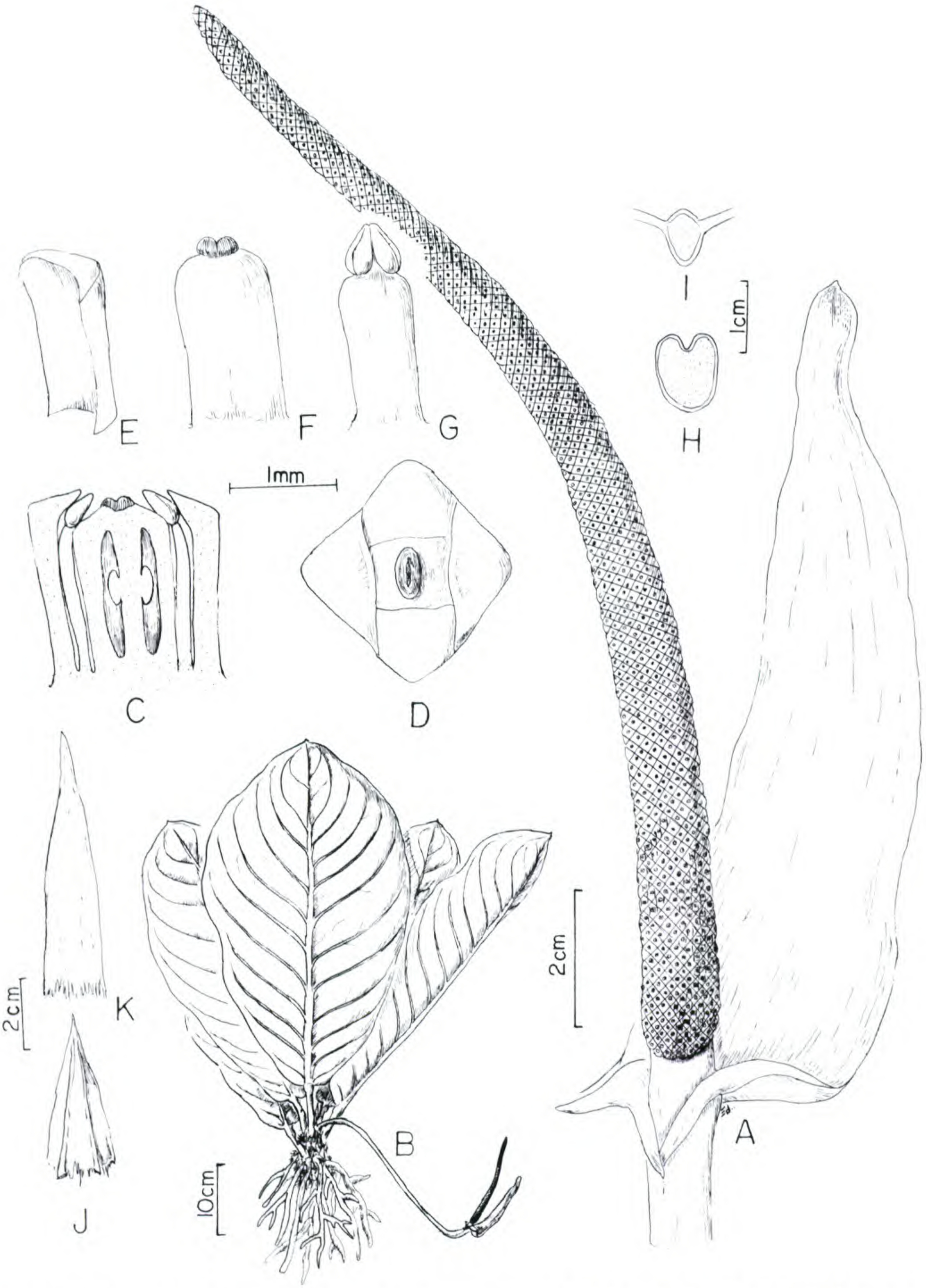

Figure 1. *Anthurium leonii* E. G. Gonçalves. —A. Inflorescence. —B. Habit. —C. Flower, longitudinal section. —D. Flower, view from above. —E. Tepal, side view. —F. Pistil, side view. —G. Stamen. —H. Petiole, cross section. —I. Midrib, cross section. —J. Prophyll. —K. Metaphyll. Drawn from the paratype, *Gonçalves et al. 725*, by the author.

grooves on upper surface, raised below; interprimary veins poorly developed or absent; tertiary veins obscure to slightly sunken above in living material, prominulous in dried leaves, obscure to slightly raised below in living material, prominulous in dried leaves; reticulate veins prominulous when dried; collective vein appearing near the apex or absent. Inflorescences usually pendent, usually shorter than the leaves; peduncle 30–46 cm long, 0.5–0.7 cm diam., 2.3 to 3.6 times longer than the petiole; spathe spreading, coriaceous, lanceolate to lanceolate-ovate, rarely lanceolate-elliptic, purplish tinged with maroon, 11–17 cm long, 1.8–2.5 cm wide, broadest slightly above the base, sometimes almost at middle, inserted at 45°–50° angle on the peduncle, acuminate at apex, obtuse at base, spathe margins almost meeting obtusely then shortly and acutely decurrent to the peduncle; spadix brown, stipitate by ca. 4 mm, tapered, slightly curved, 9.5–25 cm long, 7–11 mm diam. at base, 3–4 mm diam. at apex, broadest near base; flowers rhomboidal, 1.1–2 mm long, 0.8–2 mm wide; 9 to 13 flowers visible in principal spiral, 7 to 10 flowers visible in alternate spiral; tepals matte; lateral tepals 0.6–1 mm wide, the inner margins convex, the outer margins 2-sided; pistils not emergent; stigma ellipsoid; stamens obscuring the pistil; filaments not exserted; anthers 0.4–0.5 × 0.3–0.8 mm; thecae elliptic to ovoid, 0.4–0.5 × 0.2–0.5 mm. Infructescence unknown.

Anthurium leonii is very similar to *A. solitarium*, but differs in having a proportionally broader blade with the length × width ratio about 1.8–2.3 as compared to 2.8–4.8 in *A. solitarium*. *Anthurium leonii* usually has a higher number of primary lateral nerves (10 to 16, rather than usually 8 to 9(to 10) in *A. solitarium*), and these nerves are completely arcuate, whereas they are usually found "running straight from the midrib to the margin, and then steeply and arching rising along the margin" in *A. solitarium* (Croat, 1991: 729). Another important difference is that the spathe margins meet obtusely then are shortly and acutely decurrent onto the peduncle in *A. leonii*, whereas the spathe margins are uniformly and acutely decurrent in *A. solitarium*. *Anthurium solitarium* is known to occur in eastern Minas Gerais State and has been collected in the vicinity of the Caparaó National Park (e.g., *Leoni 2266* and *2260*), usually at elevations up to 600 m. Because of the proportionally broad leaf blade and long pendent inflorescences, no other species in section *Pachyneurium* may be confused with *A. leonii*.

Anthurium leonii belongs to section *Pachyneurium* series *Pachyneurium* because of the involute vernation, as defined by Croat (1991).

Anthurium leonii is epilithic in gneissic outcrops, usually growing together with *Philodendron edmundoi* G. M. Barroso. The plants usually grow in direct sunlight, but some individuals are also found in half-shade. Despite the fact that it is locally abundant, *A. leonii* is known only from the type locality. It is possible that it also occurs in neighboring areas, above 1000 m.

The epithet was chosen in honor of Lúcio S. Leoni, curator of the herbarium GFJP, one of the most important plant collectors of the Caparaó National Park and surrounding areas.

Paratype. BRAZIL. **Minas Gerais:** Alto Caparaó, Parque Nacional do Caparaó, Vale Verde, 1100 m s. m., 1 Feb. 2001, *E. G. Gonçalves, E. R. Salviani, L. S. Leoni & M. Peixoto 725* (GFJP, MO, UB).

Acknowledgments. I thank Lúcio Leoni for showing me living plants of *Anthurium leonii*, as well as for the herbarium facilities at GFJP. Field trips were sponsored by the Instituto Plantarum de Estudos da Flora Ltda. I am also grateful to E. Salviani for field assistance and Thomas B. Croat (MO) for valuable comments on the manuscript. The author was funded by a grant from FAPESP (99/02921-7).

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Cuphea nivea (Lythraceae), a New Species from Bolivia

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ABSTRACT. *Cuphea nivea* from northwestern Bolivia is described and illustrated. Seed and pollen characters relate it most closely to *C. ciliata*, a species occurring from southern Venezuela to southern Peru. The small xylopodium and heath-like leaves of the species suggest it is adapted to grassland habitats that experience seasonal fires.

RESUMEN. En el presente trabajo se describe e ilustra *Cuphea nivea* de la región noroccidental de Bolivia. Los caracteres de las semillas y de los granos de polen la relacionan muy estrechamente con *C. ciliata*, una especie que se distribuye desde el sur de Venezuela hasta el sur de Perú. El xilopodio pequeño y las hojas ericoides de la especie sugieren su adaptación a hábitats dominados por pastos que sufren impactos de quemas estacionales.

Key words: Bolivia, *Cuphea*, grasslands, Lythraceae.

Recent collecting efforts in support of the *Catalogue of the Vascular Plants of Bolivia* (Jørgensen et al., in progress) concentrated on a previously undercollected area northeast of Apolo, in La Paz province. A species new to *Cuphea* P. Browne, the largest genus of Lythraceae with over 260 species (Graham et al., 1993), is described from those collections.

Cuphea nivea S. A. Graham, sp. nov. TYPE. Bolivia. La Paz: Franz Tamayo, Senda Apolo-San José de Uchupiamonas, a media hora antes de llegar al Naranjal, 1798 m, 1 Oct. 2002, *T. Miranda, C. Maldonado, F. Canqui, R. Alvarez & J. Tito 141 A* (holotype, LPB; isotype, MO). Figure 1.

Herbae perennes 15–25 cm, rhizomate crasso ad 1.5 cm diam.; caules 1–aliquot, pro parte erecti, ascendentes, strigosi et glanduloso-hispiduli. Folia ovata vel anguste ovata, 3–6 × 1.5–3 mm, coriacea, suberecta, uninervia, basi rotundata ad subcordata. Racemi simplices, foliati; pedicelli 1.5–2.5 mm. Flores 6-meri, 4–5 mm longi, sine calcari, glanduloso-hispiduli; petala 6, 1.7–2.3 mm longa, nivea, vinoso-nervata; stamina 11, profunde inserta, tubum longe non aequantia; ovula 4; nectarium basi ovarii 0.5 × 0.3 mm, erectum, carinatum. Semina orbicularia, 1.7 × 1.6 mm, exalata, margine obtusa.

Diminutive perennial herbs 15–25 cm; stems 1 to few, unbranched or sparsely, irregularly branched, from a woody xylopodium ca. 1.5 cm diam.; stems wine-red, densely strigose and glandular-hispid, the white, sharp-pointed trichomes appressed and antrorsely oriented, the glandular trichomes erect, 0.5 mm long; internodes slightly shorter to slightly longer than the subtending leaves. Leaves opposite, sessile, erect, loosely to tightly appressed to the stem, ovate to narrowly ovate, 3–6 × 1.5–3 mm, coriaceous, appearing uninerved, only the midvein visible, base rounded to subcordate, apex acute, margin slightly thickened or inrolled, upper surface glabrous, lower surface minutely white-strigose; leaves scarcely reduced in size toward the stem apex. Inflorescences simple leafy racemes; flowers solitary, alternate, interpetiolar; pedicels 1.5–2.5 mm; bracteoles 0.5 mm, obscure, green. Floral tubes 6-merous, 4–5 × 1 mm including a rounded base, the base extended 0–0.2 mm beyond the attachment of the pedicel, the neck of the floral tube not contracted, the mouth blunt; outer surface wine-red dorsally, green ventrally, white-strigose and glandular-hispid, the glandular trichomes costal and intercostal; calyx lobes equal, 0.5 × 0.7 mm, triangular; appendages of the epicalyx represented by wine-red thickenings at the sinuses of the calyx lobes, short-setose, the margin not free; inner surface neither bialate nor vesiculate, densely white villous above the stamens, glabrous below; petals 6, subequal, 1.7–2.3 × 0.8–1 mm, narrowly oblong-elliptic, white with wine-red midvein, the 2 dorsal petals subtended by a bright yellow nectar guide; stamens 11, the 2 dorsalmost shortest and inserted below the other 9, the 9 uniseriate, inserted deeply in the floral tube, alternately unequal, the anthers not reaching the sinuses of the tube; filaments glabrous to sparsely white villous; anthers light yellow; pollen triangular in outline, tricolporate, non-syncolpate, pores non-protruding; exine psilate at 40×; 15 μm diam.; style included, 2.5 mm, glabrous; stigma punctiform; placental base in the ovary fleshy, semi-circular with smooth margin, 2 mm wide at capsule dehiscence; ovules 4; nectariferous disc 0.5 × 0.3

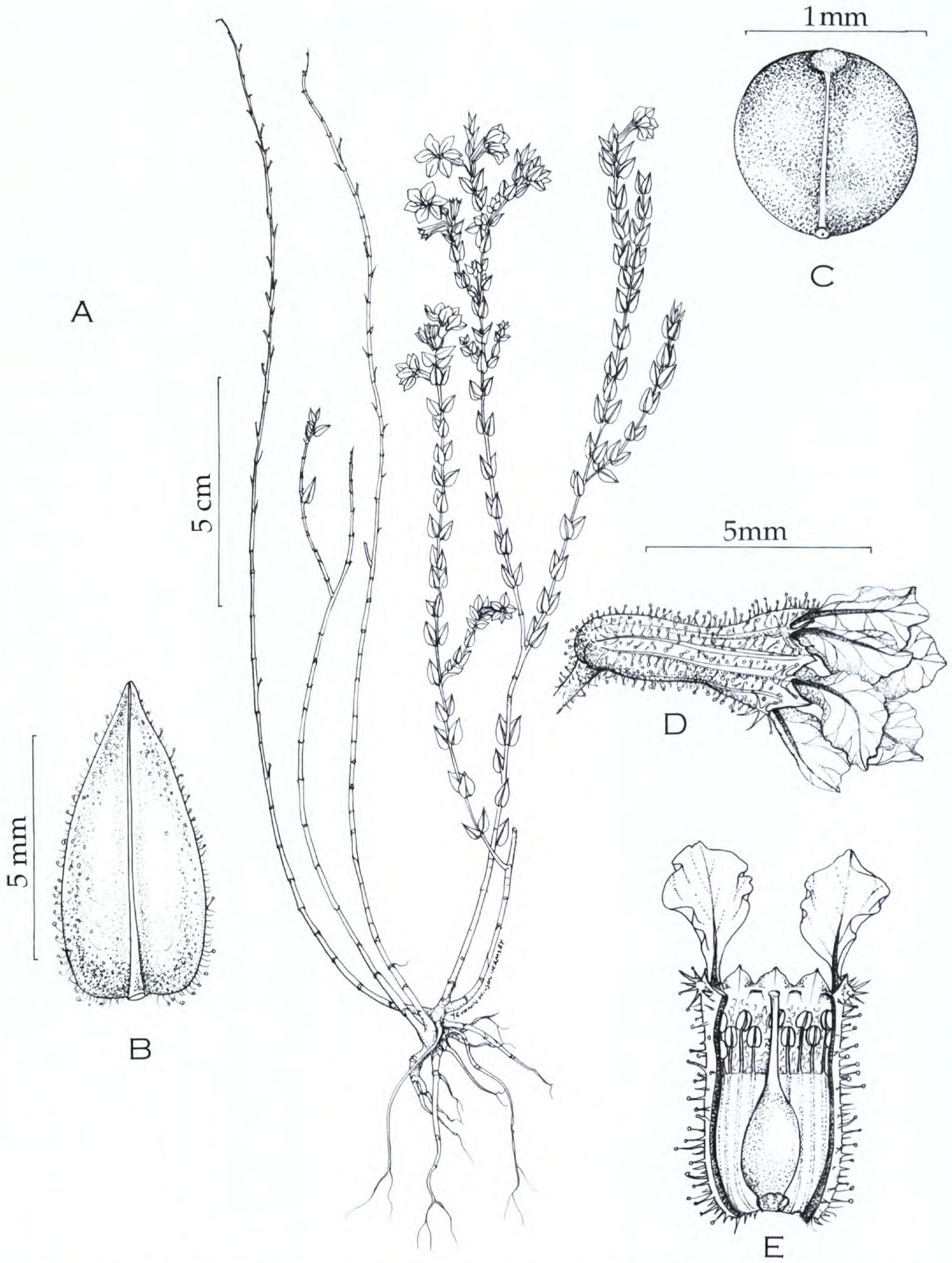

Figure 1. *Cuphea nivea* S. A. Graham. —A. Habit. —B. Leaf, abaxial surface. —C. Seed. —D. Flower, lateral view. —E. Flower opened dorsally, exposing the nectariferous, unilateral disc at the base of the ovary and the included stamens and stigma. Four petals removed for clarity. Drawn from the isotype, *Miranda et al. 141* (MO).

mm, erect at the base of the ovary, keeled. Seeds suborbicular to orbicular, 1.7 × 1.6 mm, light brown, the margin rounded, paler than the rest of the seed.

Distribution and phenology. Known only from the type area; in grassy pasturelands; 1785–1798 m. Collected in flower and fruit October, December, and April.

Cuphea nivea (sect. *Brachyandra*) is recognized by the bright white petals with wine-red midvein and the stems bearing thick, appressed, narrowly ovate leaves. Pure white petals are uncommon in the genus, although many species bear pink or pale purple petals or have four white ventral petals in combination with two purple dorsal ones. The specific epithet refers to the white petal color. The sectional assignment of the species follows the current classification of the genus (Koehne, 1903) in which section *Brachyandra* is defined by stamens so deeply inserted in the floral tube that the anthers do not reach the sinuses of the calyx lobes. Cladistic analyses based on morphology (Graham, 1998) and molecular data (Graham et al., in prep.) indicate that section *Brachyandra* is polyphyletic and the staminal character is part of a floral syndrome tied to an autogamous breeding system. The species that constitute the section represent at least four independent lineages, and the floral morphology of the primarily self-fertilizing species is convergent.

In section *Brachyandra, Cuphea nivea* shares seed and pollen features with species of the lineage that includes: *Cuphea calophylla* Chamisso & Schlechtendal, *C. melanium* (L.) R. Brown ex Steudel, and *C. ciliata* Ruiz & Pavón. Seeds of these species are non-winged with round, thickened margins, and the pollen is small for the genus (ca. 15 μm), nearly psilate, non-syncolpate, and without protruding pores (Graham, 1998). The habit of *C. nivea* approaches that of *C. ciliata*, an Andean species occurring from southern Venezuela to southern Peru. *Cuphea ciliata* differs in having more lax, much-branched stems, linear leaves that are not so consistently appressed to the stem, pedicels 7–14 mm, and 6 to 10 ovules, not 4 as in *C. nivea*. Stems of *C. nivea* are less woody and more erect than in *C. ciliata*, the leaves are more appressed, and the xylopodium is better developed.

The thick, heath-like leaves and woody xylopodia of *Cuphea nivea* are also characteristic of several, mostly Brazilian, species of section *Euandra* subsect. *Oidemation*, and *C. nivea* could, at first glance, be considered a member of that subsection. However, numerous differences in floral and pollen morphology indicate that the similarity is due to convergence. Members of both sections occur in open savannas where coriaceous, closely appressed leaves and xylopodia are considered advantageous to survival during seasonal fires. The presence of *C. nivea* suggests that the collection area, now pastureland given to cattle-grazing, was once a natural savanna subject to burning.

Paratypes. BOLIVIA. **La Paz:** Franz Tamayo, Senda Apolo-San José de Uchupiamonas, a 15 minutos del arroyo Turnia hacia el E de la senda, 2 Dec. 2002, *T. Miranda, C. Maldonado & F. Canqui 388* (LPB not seen, MO); a media hora antes de llegar al Naranjal, 17 Apr. 2003, *T. Miranda, L. Cayola, F. Canqui, R. Alvarez & J. Tito 718* (LPB not seen, MO).

Acknowledgments. I thank Yevonn Wilson-Ramsey for preparing the illustration, and Peter Jørgensen for information about the Bolivian collection site.

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Two New Species of *Hortia* (Rutaceae) from Amazonia

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Abstract. *Hortia nudipetala* Groppo and *H. vandelliana* Groppo (Rutaceae, Toddalioideae, Toddaliinae) from Amazonia are described and illustrated. The first species is known from the sandy, periodically inundated margins of tributaries of the upper Rio Negro, and the second from Brazilian and Venezuelan Amazonia. Comments on affinities of the two species, geographic distribution, and phenology are provided.

Resumo. *Hortia nudipetala* Groppo e *H. vandelliana* Groppo (Rutaceae, Toddalioideae, Toddaliinae) da Amazônia são descritas e ilustradas. A primeira espécie é conhecida das margens arenosas e periodicamente inundadas dos tributários do alto Rio Negro e a segunda da Amazônia Brasileira e Venezuelana. São apresentados comentários sobre as afinidades, distribuição geográfica e fenologia das duas espécies.

Key words: Amazonia, Brazil, *Hortia*, Rutaceae.

Hortia Vandelli is a Neotropical genus of Rutaceae traditionally included in subtribe Toddaliinae, subfamily Toddalioideae (see Engler, 1931). The 10 species are distributed from Panama to the state of São Paulo in Brazil, but most occur across Amazonia. These taxa are trees or shrubs with simple leaves crowded near the apex of the branches and have showy, wide corymbose terminal inflorescences, red to pink flowers, and a baccate fruit with abundant oil glands. During a study aimed at a revision of the genus, two new species were recognized.

The descriptions are based only on collections from mature individuals. Flowers and fruits of herbarium specimens were rehydrated before being measured and drawn. The terminology for shapes of leaves and other organs follows Hickey (1979) and Radford et al. (1974); for inflorescences, Weberling (1989); and for fruit, Spujt (1994).

Hortia nudipetala Groppo, sp. nov. TYPE: Brazil. Amazonas: São Gabriel da Cachoeira, alto Rio Negro, Rio Uaupés, Igarapé Tubuari, acima do Seringal Pago, 22 Nov. 1987 (fl), *H. C. de Lima, M. L. Kawasaki, J. Ramos & R. P. de Lima 3278* (holotype, SPF; isotypes, INPA, NY, RB). Figure 1.

Ab omnibus speciebus generis petalis glabris distincta. Species *H. brasilianae* similis, sed foliis angustioribus distincte petiolatis atque nervo inframarginali manifesto differt.

Shrub 2–3 m tall; diameter of trunk unknown; branches erect, glabrous; outer bark scarcely fissured, the inner bark pale yellow. Leaves chartaceous, patent to ascending, glabrous, petiolate; blade 15.8–24.1 × 2.9–3.6 cm, with abundant pellucid dots, apparently lustrous on adaxial surface, dull on abaxial surface, narrowly oblong to lanceolate, apex rounded, acute or retuse, apiculate or not, margin entire, revolute, thickened, base attenuate; midrib thick, flat on the adaxial surface, prominent below, the secondary veins in 18 to 22 pairs diverging from midrib at 55°–64°, prominent on both faces, united in an evident inframarginal vein, the tertiary veins prominent on both faces; petiole 1.4–3 cm long, clearly distinct from blade, winged, thickened at base. Inflorescence a pleiothyrsoid, 5–7 × 7–8 cm, the branches slightly complanate, minutely fissured transversely; bracts and bracteoles triangular, the proximal ones 1 × 3 mm, not crowded at base of inflorescence, the distal ones ca. 1 × 1 mm; thickness of the axis 0.5 cm at base, 0.2 cm after the 4th order of ramification; pedicels ca. 2 mm long. Flowers 5-merous, ca. 7–8 mm diam.; buds ovoid; calyx cotyliform, 5-lobed, the lobes triangular, ca. 1.4 mm long, obtuse or acuminate, ciliate; petals 5, pink, oblong to triangular, ca. 6 × 2.5 mm, apiculate, glabrous; filaments ca. 3–5 × 1 mm, inserted on the apex or side of the disc; anthers ca. 1.5 mm long, oblong; disc cotyliform, 5-lobed, fleshy, adnate to a very short gynophore; gynoecium ovoid, ca. 5 × 2 mm, the base immersed in the disc; ovary 5-lobed, slightly raised upon the gynophore; style conical, ca. 1 mm long. Fruit (immature) a globose berry, ca. 6 × 6 mm, green; seeds (mature) not seen.

Distribution and habitat. *Hortia nudipetala* is known so far by only a few collections made in the region of the upper Rio Negro, in the vicinity of São Gabriel da Cachoeira, state of Amazonas, Brazil (Fig. 3). It was found on the periodically inundated margins of some tributaries of the Rio Negro

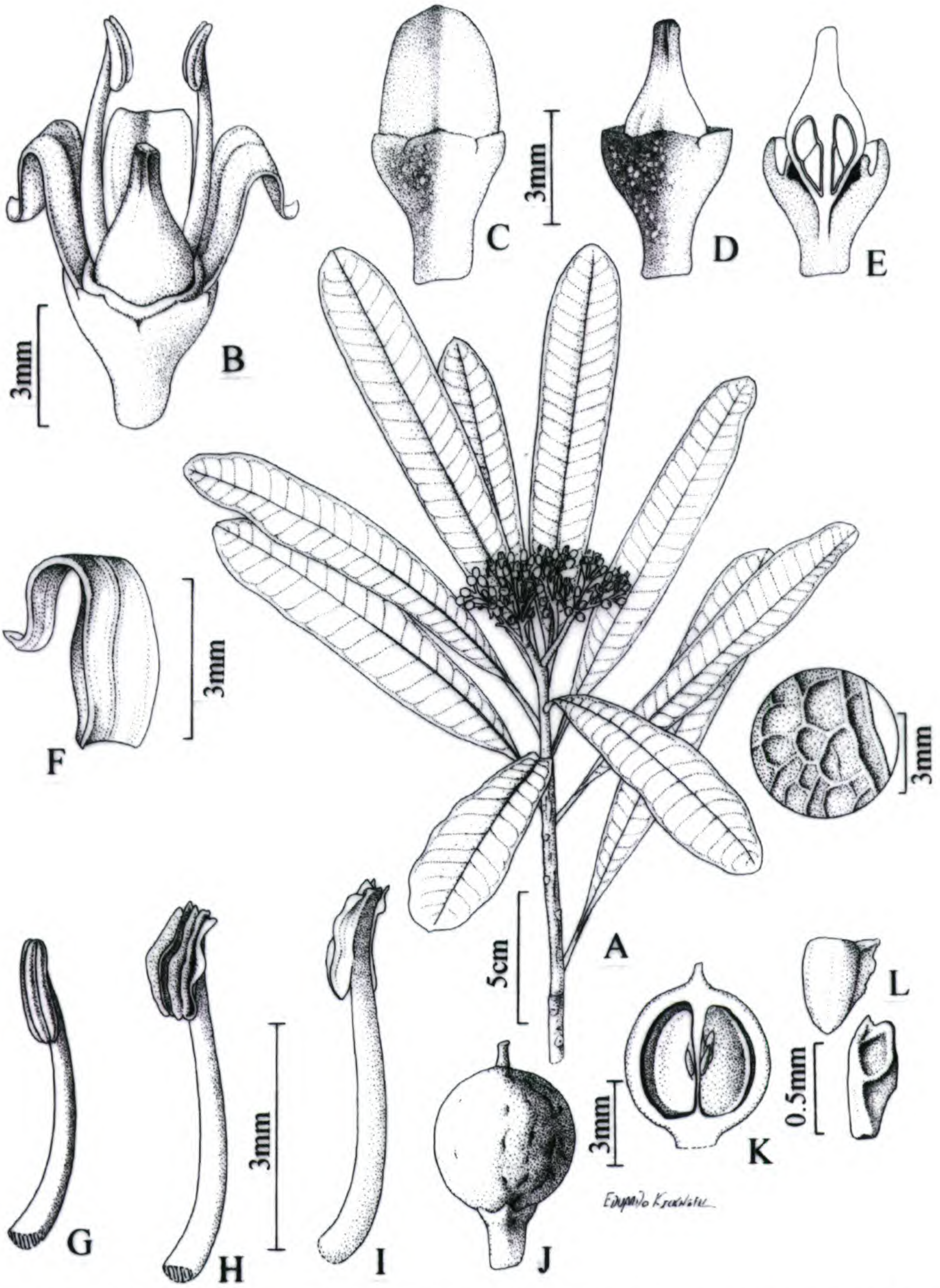

Figure 1. *Hortia nudipetala* Groppo. —A. Habit with detail of the venation and inframarginal vein on the abaxial surface of the leaf. —B. Flower. —C. Bud. —D. Gynoecium. —E. Gynoecium in longitudinal section. —F. Petal. —G. Stamen. —H. Stamen with open thecae. —I. Same in abaxial view. —J. Immature fruit; note the remnant of the style. —K. Immature fruit in longitudinal section. —L. Two ovules, the lower one aborted. A–I and L from *Lima et al. 3278*; J, K from *Schultes & López 9687*.

(such as the Uaupés River) and along some igarapés (small, black-water rivers) on sandy soils, in campina (an open vegetation of low trees and shrubs). Specimens were collected with flowers in November and January to March, and with immature fruits in March.

Hortia nudipetala is the only species in the genus where the petals are totally devoid of the characteristic trichomes that otherwise occur on the adaxial surface of the petals. It is similar to *H. brasiliana* Vandelli ex DC. (an arborescent species of the Atlantic coast of Brazil), in particular because of the flowers, i.e., with similar shape of the ovary and stamens; however, the leaves of *H. nudipetala* are narrower (to 3.6 cm vs. 3–9(–11) cm in *H. brasiliana*) with an evident inframarginal vein, and the petiole is more distinct. In addition, the two species are largely allopatric.

No economic uses or common names are reported for this species.

Paratypes. BRAZIL. **Amazonas:** São Gabriel da Cachoeira, Rio Negro, Igarapé Toury (Tubuari), *R. L. Fróes 27916* (IAN); Igarapé Tuari (Tubuari), lado oposto à Ilha de Aparecida, *W. A. Rodrigues 10878* (NY); Rio Uaupés, Taracuá, *R. E. Schultes & F. López 9687* (GH, MO).

Hortia vandelliana Groppo, sp. nov. TYPE: Brazil. Amazonas: São Paulo de Olivença, alto Rio Solimões, platô ao sul da cidade, estrada para a localidade de Bom Fim, 25 Nov. 1986 (buds), *C. A. Cid et al. 8538* (holotype, SPF; isotypes, HAMAB, INPA 2 sheets, NY). Figure 2.

Species foliis *H. coccinae* comparabilis, sed petalis triangularibus, alabastris ovatis atque petalis trichomatibus majoribus differt. *H. brasilianae* etiam similis, sed alabastris fructibusque minoribus atque foliis nervis non manifestis differt.

Tree or shrub (2–)4–20 m tall, trunk up to 60 cm diam.; branches erect, glabrous; outer bark scarcely fissured, the inner bark pale yellow. Leaves chartaceous to strongly coriaceous, patent to ascending, glabrous, petiolate; blade 10–22.2 × 4.1–7.2 cm, with abundant pellucid dots, apparently lustrous on adaxial surface, dull on the abaxial surface, obovate, the apex rounded, seldom retuse, the margin entire, revolute, thickened, the base attenuate to decurrent; midrib thick, flat on the adaxial surface, prominent below, the secondary veins in 10 to 12 pairs diverging from midrib at 35°–53°(60°), immersed in the mesophyll on both faces, usually not visible on the abaxial surface, not united in an inframarginal vein, the tertiary veins not visible on both surfaces, immersed in the mesophyll; petiole 1.2–2(–3) cm long, sometimes not clearly distinct from blade, winged, thickened at base. Inflorescence a pleiothyrsoid, 9–13 × 6–11 cm, the branches terete, minutely fissured transversely; bracts and bracteoles triangular, the proximal ones ca. 3 × 5 mm, not crowded at base of inflorescence, the distal ones ca. 0.5 × 1 mm, ciliate; thickness of the axis 0.6–0.7 cm at base, 0.2 cm after the 4th order of ramification; pedicels ca. 1.5 mm long. Flowers 5-merous, ca. 8 mm diam.; buds ovoid; calyx cotyliform, 5-lobed, the lobes triangular, ca. 1.4 mm long, obtuse or acuminate, not ciliate; petals 5, pink, triangular, ca. 4 × 2.5 mm, apiculate, with a tuft of trichomes on the base of the adaxial face, the trichomes straight, 0.5–0.9 mm long; filaments ca. 4 × 0.9 mm, inserted on the apex of the disc; anthers ca. 2.5 mm long, oblong; disc cotyliform, 5-lobed, fleshy, adnate to a short gynophore; gynoecium ovoid, ca. 3 × 2 mm, the base immersed in the disc; ovary slightly 5-lobed, raised upon the gynophore; style conical, ca. 1 mm long. Fruit an ellipsoid berry, ca. 3.5 × 2.5 cm, green or light yellow when mature; seeds conical, ca. 8 × 6 mm, the testa blackened, the hilum basal; cotyledons 5–6 × 4 mm, oval.

Distribution and habitat. Two of the six specimens of *Hortia vandelliana* (the type collection and *Silva et al. 532*) have been collected in eastern Amazonas state, Brazil, where it occurs in the Rio Solimões basin, in Amazonian "caatinga" (arborescent vegetation on sandy soils), and in "terra firme" forest (non-inundated tall forest); another two collections (*Ribeiro 1026* and *Fróes 28029*) are from river margins of the Rio Negro basin, on sandy or clay soils. There is one record from the department of Amazonas, Venezuela, and another from Cura-ci-ha range (600 m of altitude), state of Roraima, Brazil (Fig. 3). The species was collected with flowers in June and November, and with fruits in February, March, and July.

The shape, size, and nervation of the leaf blade of this species are similar to those of *Hortia coccinea* Spruce ex Engler. *Hortia vandelliana* differs from that species, however, by a petiole that is sometimes indistinct (vs. clearly distinct) from the blade, by smaller (8 mm vs. 14 mm diam.) flowers, and by the triangular (vs. oblong) petals bearing longer trichomes (0.5–0.9 vs. 0.2–0.3 mm) that are present just as tuft on the base of the (vs. the entire) adaxial surface.

The flowers of *Hortia vandelliana* are smaller than those of *H. brasiliana* (8 mm vs. 13 mm diam.), but similar in all other aspects. In *H. vandelliana* the secondary and tertiary veins are immersed in the leaf blade, while in *H. brasiliana*

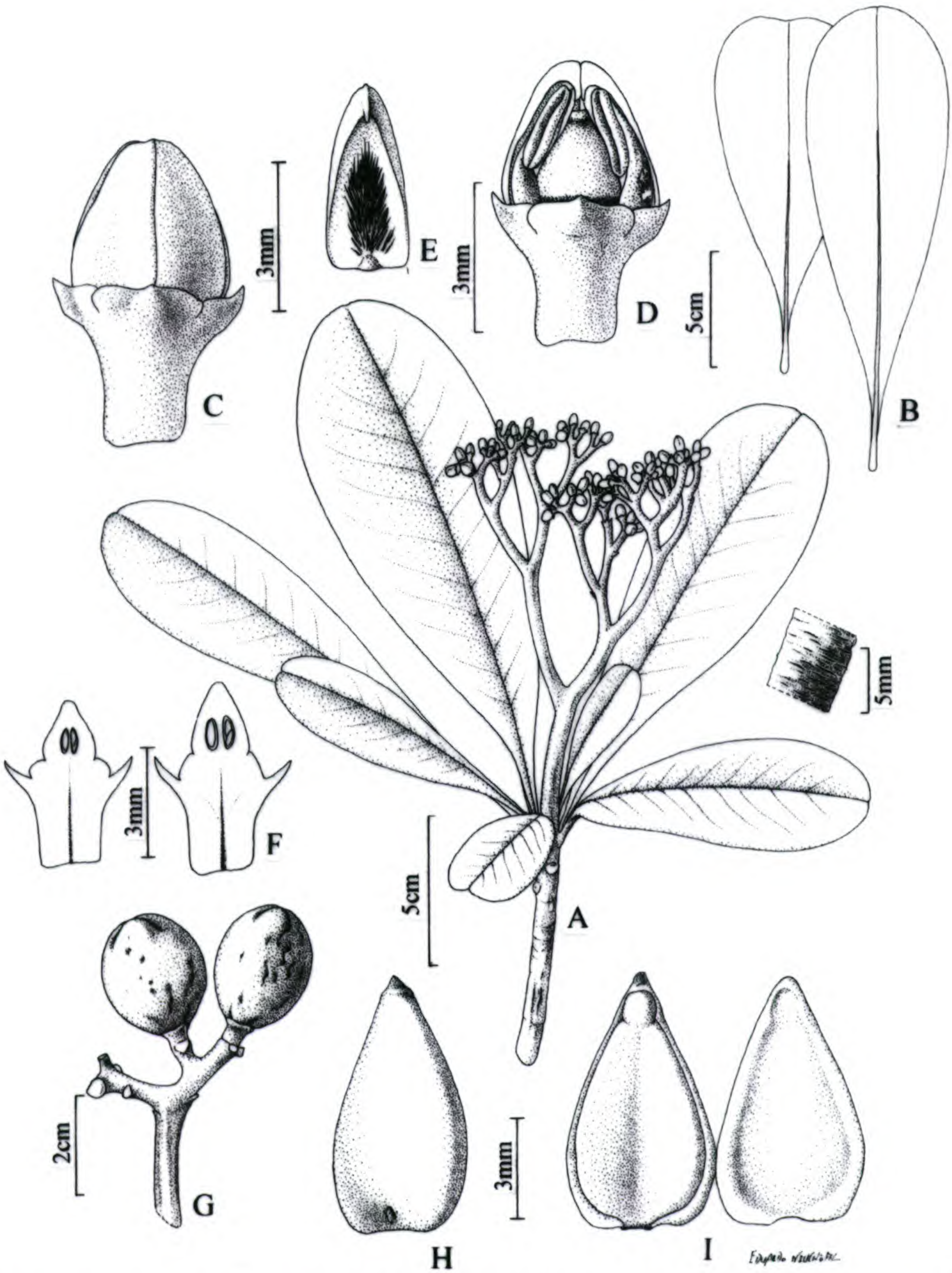

Figure 2. *Hortia vandelliana* Groppo. —A. Habit, with detail of the fissures in the axis of the inflorescence. —B. Leaves. —C. Bud. —D. Bud with two petals and two stamens removed. —E. Petal, adaxial view. —F. Gynoecium of two flowers in longitudinal section. —G. Fruits. —H. Seed. —I. Seed in longitudinal section, showing embryo (part of endosperm on the right). A, C–F from *Cid et al. 8538*; B, left leaf from *Silva et al. 532*, right leaf from *Murça-Pires et al. 16945*; G–I from *Murça-Pires at al. 16945*.

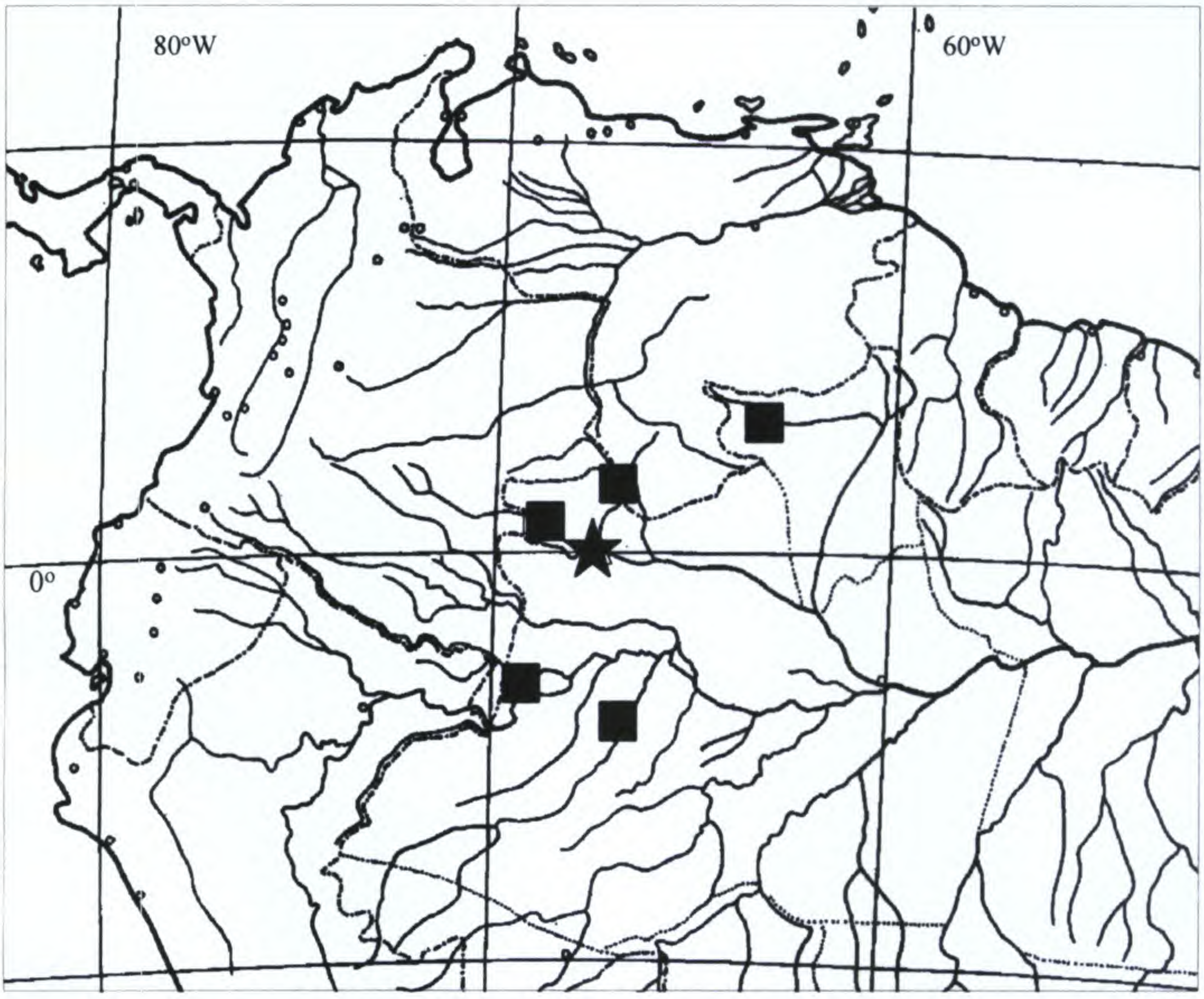

Figure 3. Known distributions of *Hortia nudipetala* (star) and *H. vandelliana* (squares) in Brazil and Venezuela.

they are evident and prominent. In *H. vandelliana* (vs. *H. brasiliana*) the secondary veins diverge from the midrib at less obtuse angles [35°–53°(60°) vs. 60°–69°] and the fruits are smaller (ca. 3.5 × 2.5 cm vs. 4.5–5.5 × 4.5 cm in *H. brasiliana*) and globose to obovoid (vs. ellipsoid).

The specific epithet honors Domenico (Domingo or Domingos) Vandelli (1730–1816), Italian physician and botanist who described the genus *Hortia*.

No economic uses or common names are reported for this species.

Paratypes. BRAZIL. **Amazonas:** Carauari, Rio Juruá, Poço Juruá I, *A. S. L. da Silva, N. A. Rosa & R. P. Bahia 532* (INPA); São Gabriel da Cachoeira, rio Içana, perto da cachoeira Malacacheta, *R. L. Fróes 28039* (IAN); Iuareté, margem do rio Uaupés, *B. G. S. Ribeiro 1026* (MG). **Roraima:** Rio Uraricoera, Serra Cura-ci-ha, *J. Murça-Pires, W. A. Rodrigues, N. A. Rosa & G. Ranzani 16945* (INPA, MBM, MG). VENEZUELA. **Amazonas:** Guainía, along road from Maroa to Yabita, ca. 700 m from Yabita, *P. Acevedo-Rodriguez, G. Aymard, P. E. Berry & R. Schargel 10285* (NY).

Acknowledgments. The first author thanks the curators of GH, HAMAB, IAN, INPA, MBM, MG, MO, NY, and RB for the loan of specimens, and especially the curator of NY, for the gift of important collections of *Hortia* to SPF; Eduardo Kickhöfel for the illustration; and Jacquelyn Kallunki for both her helpful suggestions and improvements to the English text and her constant and enthusiastic help. Financial support from FAPESP (Fundação de Amparo à Pesquisa do Estado de São Paulo, grant no. 00/07401-0) is duly acknowledged.

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A New Name in Korean *Silene* (Caryophyllaceae)

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Abstract. While preparing a treatment of the genus *Silene* L. for the *Generic Flora of Korea*, the following novelty was found and is published in this contribution. Accepting the current generic concept of *Silene*, we noticed that one Korean endemic species, *Melandrium umbellatum* Nakai, should be transferred to *Silene*. However, transfer of the specific epithet to *Silene* would create a later homonym of *Silene umbellata* Gilibert (= *Silene armeria* L.). Therefore, we here provide the following new name:

Figure 1. The holotype of *Silene myongcheonensis* Suk-Pyo Hong & Hye-Kyoung Moon in TI.

Silene myongcheonensis Suk-Pyo Hong & Hye-Kyoung Moon.

Key words: Caryophyllaceae, Korea, *Silene*.

The revision of the genus *Silene* L. (Caryophyllaceae) for the *Generic Flora of Korea* is in progress (Hong, in prep.). The circumscription of *Silene* has long been debated, and there has been a tendency toward expanding the genus during recent decades (Greuter, 1995). At the infrageneric level, a lumping trend has been prevalent (Chowdhuri, 1957; Šourková, 1978) and is also supported by nuclear gene sequence data (Oxelman & Lidén, 1995). Such generic limits have been adopted for the *Generic Flora of Korea* treatment.

The Korean endemic species *Melandrium umbellatum* Nakai was originally described from Mt. Chilbo-Shan, Myongcheon-Gun, Hamkyungbuk-Do. This species is similar to *Silene capitata* Komarov by having pinkish petals, but is distinct in its umbel-like cymes and by having glandular trichomes on both calyx and peduncles. The prior delimitation of *Melandrium* from other relatives, including *Silene* s. str., was strictly on the basis of carpel and hence style number; this character is *not* invaluable among these taxa. This necessitates a new combination in the genus *Silene* for *Melandrium umbellatum*. Unfortunately, the resulting name of the new combination would be a later homonym of *S. umbellata* Gilibert [= *Silene armeria* L. 1753: 420], which is illegitimate under Article 53.1 of the *Saint Louis Code* (Greuter et al., 2000). Therefore, a new name is needed and is here validated for its use in the upcoming account of the genus in the *Generic Flora of Korea*.

Silene myongcheonensis Suk-Pyo Hong & Hye-Kyoung Moon, nom. nov. Replaced name: *Melandrium umbellatum* Nakai, Bot. Mag. (Tokyo) 33: 48. 1919, not *Silene umbellata* Gilibert, Fl. Lit. Inch. 2. 170. 1782. TYPE: "Corea, in montis Hichihozan [Korea, Hamkyungbuk-Do, Myongcheon-Gun, Mt. Chilbo-shan]," 4 Aug. 1918, *T. Nakai 6985* (holotype, TI). Figure 1.

Acknowledgments. We are grateful to H. Ohba (TI) for allowing us to examine material. We are also thankful to W.-T. Lee and K.-O. Yoo for providing useful data. The research was supported by a grant (no. 052-041-026) from the Core Environmental Technology Development Project for Next Generation funded by the Ministry of Environment of the Korean Government.

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Studies in the Cleomaceae II: *Cleome boliviensis*, a New, Spiny, Large-Flowered Andean Species

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ABSTRACT. *Cleome boliviensis* Iltis, a large-flowered new species of the speciose, mostly spiny section *Tarenaya* (Rafinesque) Iltis [validated here], is described, illustrated, and its relationship to other species discussed. This xerophytic subshrub, widespread and common in the Andes of southern Peru and Bolivia (and becoming weedy in adjacent Amazonian lowlands), differs from the allopatric, more eastern, lowland, annual *C. hassleriana* by its more or less perennial habit, whitish to pinkish white flowers, finely glandular-pubescent fruits, and smaller seeds with abundant, minute (use 20× lens), oil-containing, light-refracting, caruncular bulliform cells. These densely cover the flat seed faces and often the mouth of the seed "cleft," and appear to be related to dispersal by ants. At the edge of its range, the new species seems to hybridize with other species of section *Tarenaya*, such as *C. parviflora* and long-fruited *C. spinosa* s.l. recently introduced from northeastern Brazil. Myrmecochory in the Cleomaceae is discussed and appears to have arisen independently several times.

RESUMEN. Se describe e ilustra *Cleome boliviensis* Iltis (Cleomaceae), una nueva especie de flores grandes, perteneciente a la sección *Tarenaya* (Rafinesque) Iltis, una sección con numerosas especies en su mayoría espinosas; se discute su relación con otras especies afines. Es un subarbusto xerofítico, ampliamente distribuido en los Andes del sur de Perú y de Bolivia (llega a ser una maleza adventicia en áreas bajas aledañas de la Amazonía), difiere de la especie alopátrica *C. hassleriana* por su hábito más o menos perenne, flores blanquecinas hasta rosado blanquecinas, por sus frutos finamente pubescente-glandulares y semillas más pequeñas con abundantes diminutas (use una lupa de 20 ×) células carunculares buliformes, que contienen aceites y reflejan la luz. Éstas cubren densamente las caras aplanadas de las semillas y a menudo la boca de la "escotadura" de la semilla y sugieren la dispersión por hormigas. En el límite de su distribución geográfica, esta especie parece formar híbridos con otras especies de la sect. *Tarenaya* como *C. parviflora* y *C. spinosa* s.l., una especie de fruto largo de reciente introducción en el nororiente de Brasil. Se discute la mirmecocoria en las Cleomaceae que parece haber evolucionado varias veces, independientemente.

Key words: Andean biogeography, ant-dispersal, Bolivia, Cleomaceae, *Cleome* sect. *Tarenaya*, myrmecochory.

Throughout extensive montane and submontane areas of Bolivia and adjoining southern Peru (Fig. 3) there grows a common large-flowered, very spiny, shrubby *Cleome*, one of the more than 40 members of the speciose, mostly spiny, almost exclusively New World *Cleome* sect. *Tarenaya* (see below and Jacobs, 1960; Iltis, 1952, 1967). Though this strikingly beautiful species is represented by many herbarium collections and has long been recognized as distinct (Iltis, 1952, 1967), it lacks a properly published binomial.

Cleome sect. **Tarenaya** (Rafinesque) Iltis, comb. et stat. nov. Basionym: *Tarenaya* Rafinesque, Sylva Telluriana 111. 1838. TYPE: *Tarenaya spinosa* (Jacquin) Rafinesque = *Cleome spinosa* Jacquin.

Mostly annual herbs, usually glandular pubescent, often with epidermis-derived paired spines or thorns in the stipular position at the base of the multifoliolate, palmately compound leaves, with many-flowered bracteate inflorescences, flowers with 6 stamens, elongate gynophores and many-seeded siliques, the seeds with a deep hollow cleft chamber closed on all sides by distinct cleft membranes from embryo vertex to seed mouth (Iltis et al., in prep.).

A group of ca. 40 New World species and one West African (Iltis, 1967).

The above change in status, made previously informally by Jacobs (*Flora Malesiana I* 6(1): 100, 1960), is herewith validated.

The forthcoming enumeration of the Bolivian flora by the Missouri Botanical Garden and the National Herbarium of Bolivia and of the genus *Cle-*

ome for Bolivia by Lupita Sánchez (Sánchez, in prep.) necessitates its formal publication as:

Cleome boliviensis Iltis, sp. nov. TYPE: Bolivia. La Paz: "Plantae Andium Boliviensium, Prov. Larecaja, vicinus Sorata, Challapampa, ad rivium, in schistosis, Reg.[ion] temp[lada], 2600 m, Sept. 1857–Jan. 1858," *G. Mandon 938* (holotype, WIS; isotypes, BM, F, G, GH, K, LE, LPB, NY, P, PR, S, W). Figures 1–4.

Haec species a *Cleome hassleriana* et *C. spinosa* habitu suffruticoso perenni (vel annuo?), capsula glanduloso-puberula, seminibus minoribus cellulis bulliformibus caruncularibus membranas fissurales omnino obtegentibus atque floribus albidis vel albido-roseis distinguitur.

Erect, herbaceous to suffruticose, much-branched, ill-smelling, coarse, perennial, spiny herbs or subshrubs, (0.5–)1–1.6(–2.2) m tall, to 2 m across, densely viscid glandular-pilose to -hirsute generally, the hairs rather short and stiff and frequently intermixed with many scattered spinules, these often also gland-tipped; stems spiny and densely glandular-pubescent, with the paired, stout "stipular" spines 3–6 mm long, 2–6 mm wide at the base (where often glandular pubescent), divergent at 90° to ± recurved. Major leaves 5- to 7-foliolate, on petioles 2–9 cm long, prominently armed with ascending or divergent prickles and spines (Fig. 1); leaflets narrowly elliptic to oblanceolate-elliptic, broadly acute to acuminate at the tip, attenuate to the base, 6–15(–30) × 2–8(–10) cm, rarely larger on vigorous young shoots, often somewhat conduplicate, entire (but microscopically serrulate, the denticulations scarcely more than gland-tipped hairs), glandular-pubescent and somewhat scabrous, rarely subglabrous above, glandular hirsute-pilose beneath, particularly along the midrib and prominent veins; lateral veins on each side of the midrib 8 to 12. Racemes often very dense, elongating to 40 cm or more by the time they have finished blooming, the primary ones each with up to 200 or more flowers opening acropetally (i.e., estimated by counting the persistent floral bracts), but with only ca. 20 to 40 buds and 3 to 5(to 10) open flowers at any one time at the apex; floral bracts 1-foliolate (or the lowest flowers frequently subtended by 3-foliolate bracts or rarely full-sized leaves), narrowly to broadly ovate- to oblong-elliptic, acute to obtuse at the tip, cuneate to rounded or subcordate at the base, mostly 6–15 × 4–12 mm, their 1–8 mm long petioles frequently subtended by a pair of minute prickles. Flowers on pedicels (13–)22–32(–41) mm long; sepals narrowly lanceolate, acute, 6–10 × 2–3 mm, soon deciduous, densely glandular-pubescent throughout, especially toward the tip, the glands often mostly sessile or subsessile; petals spatulate, 24–35 × 4–10 mm, showy, basically mostly white, but often variously flushed with lilac or pale pink, or rarely dark blood red to a rich pinkish purple, glabrous or rarely with a few scattered glandular hairs on the back and top when in bud, the blade obovate-elliptic, rounded, gradually attenuate to the slender claw, the claw ⅓ to ⅔ as long; disk (androgynophore) slightly fleshy, conic, 3–4(–5) mm long; stamens 6, the filaments glabrous, 50–70 mm long, red, reddish violet, purple, or deep maroon, the anthers (7–)9–13 mm long; ovary cylindric to fusiform, 10–13 × 1 mm, finely and densely glandular-pubescent; gynophore 4–7 cm long, glabrous, and together at least initially with pedicel and silique often strongly arching upward at 45°. Mature siliques oblong to cylindric, sometimes somewhat clavate (i.e., wider toward the tip), broadly acute to rounded at the apex, obtuse to long-attenuate at the base, (4–)5–8(–9) × 0.5–0.8 cm, usually stout with the valves firm to somewhat lignified, and with the evenly smooth to scaberulous and continuous (never torulose) surface ± sparsely and minutely glandular-puberulent (the relatively large glands sessile or subsessile on short stalks); stigma capitate, sessile or subsessile; gynophore glabrous, stout, straight, (35–)50–95 mm long; androgynophore 3–6 mm long; pedicel (15–)25–40(–47) mm long, divergent to stiffly ascending and continuous with the gynophore and silique, often arching upward together; seeds often many, 100 to 400 or more per silique, reniform-subspherical or -obovoid, very small, 1.5–1.9 × 1.4–1.7 × 1.1–1.3 mm, brown to dark brown or almost black when mature, smooth or essentially so, finely longitudinally striate, the internal cleft cavity oblong to obovate in cross section, narrowed toward the vertex, relatively small; seed cleft-membranes (i.e., on the 2 ± grooved or flat sides of the seed connecting the two curved ends, or "claws") totally covered over by ± densely aggregated, small (use 20× lens), varnished, light-reflecting, oil-containing, bulliform cells which may spread into, and completely occlude, the mouth of the cleft and spill over onto the surrounding testa, and sometimes even onto the back of the seed, forming a densely caruncular surface (see below and Fig. 2); claws subequal, the radicular claw considerably longer. $2n = 20$.

Habitat and distribution. Foothills and mountains of southern Peru and Bolivia (Fig. 3), at elevations of (250–)1700–2800(–3500) m, on open, dry, stony slopes among scattered shrubs, in rocky beds of dried-up mountain streams, and along

Figure 1. *Cleome boliviensis* Iltis. —A. Habit, with characteristic ascending young siliques. —B. Petiole with spines mostly at right angles or somewhat antrorse. A, B based on *Ugent 5112*. Drawing by Kandis Elliot.

shrubby, moist riversides, from "bosques montañosos [cloud forests] con muchas epífitas" down to transitional humid savannas, in open sandy soils and arid waste places, rocky roadsides and fields, at lower elevations weedy and adventive in fields and along roads, rarely cultivated for its showy flowers in gardens.

Phenology. Flowering and fruiting intermittent-

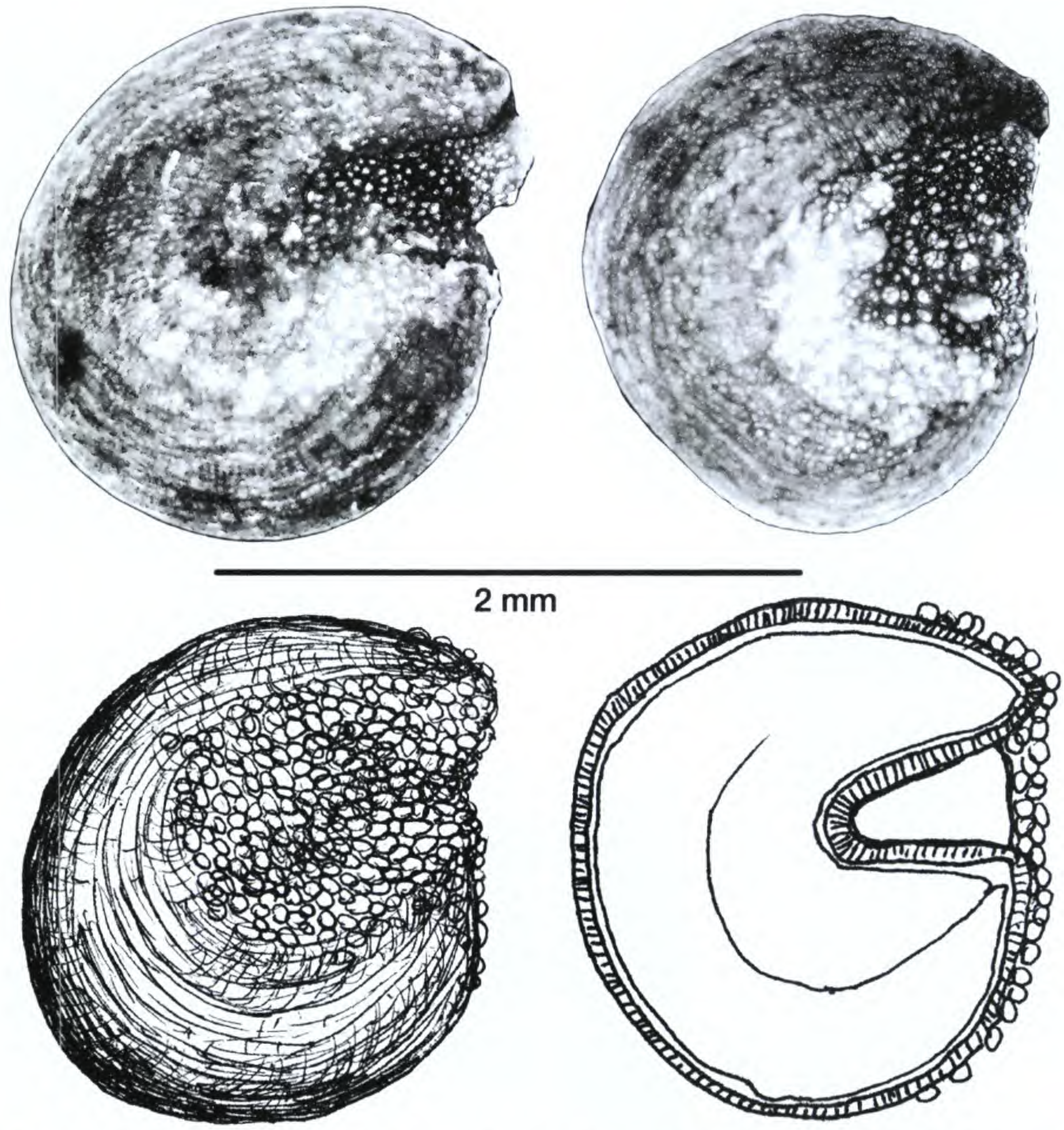

Figure 2. Four assorted seeds of *Cleome boliviensis* showing characteristic oil-filled bulliform cells in seed cleft and on seed faces, each from a different specimen. Drawing by the author.

ly throughout the year but apparently mostly from October to July.

Vernacular names and uses. Peru. Cuzco: "*Quichita*" (*McCarroll 59*), as a "remedy for pains of rheumatism." BOLIVIA. Cochabamba: "*Khichita*" (*Baer 223*), reported simply as "medicinal," and "*Kichita*" (*Ugent 4593*), where "the leaves when crumpled and stuffed into the ear are said to cure earaches" [see Iltis, 1960: 289, for similar reports from Africa, where the mustard-oil-containing, acrid leaf juices, seeds, or whole seed pods of the nearly pantropic weedy *Cleome gynandra* (L.) L. are placed into the ear canal to dissolve ear wax, and where poultices of the leaves or fruits are applied for various purposes, including to relieve the pain of rheumatism].

Cleome boliviensis is a common and widespread, mostly low-to-mid-elevation Andean xerophyte, with a modern range that evidently now heavily reflects human influence. Not only is it often weedy, but in Bolivia (*Saravia 11156*) and in Argentina (*Pederson 177*) it is reportedly cultivated as an ornamental in gardens for its "fine pink flowers" (Bolivia, *Brooke 5018*). E. K. Balls (ex sched.) made the following field observations on *C. boliviensis* in Bolivia: "Bushy shrubs to 5 ft. tall and 6 ft. or more through. Leaves sticky, with an unpleasant smell, stems hairy and woody, usually red. Flowers pink with deep maroon stamens." The showy flowers must make this a beautiful species, though the abundant spines might well discourage garden cultivation.

Relationships. *Cleome boliviensis* is one of a half dozen or more segregates of the old "C. spinosa" s.l. complex to which all of the larger-flowered, 5- to 9-foliolate, spiny *Cleome* plants had been referred previous to my Ph.D. thesis (Iltis, 1952). Of the South American taxa, it is apparently most closely related to the commonly cultivated, sometimes adventive *C. hassleriana* Chodat, the

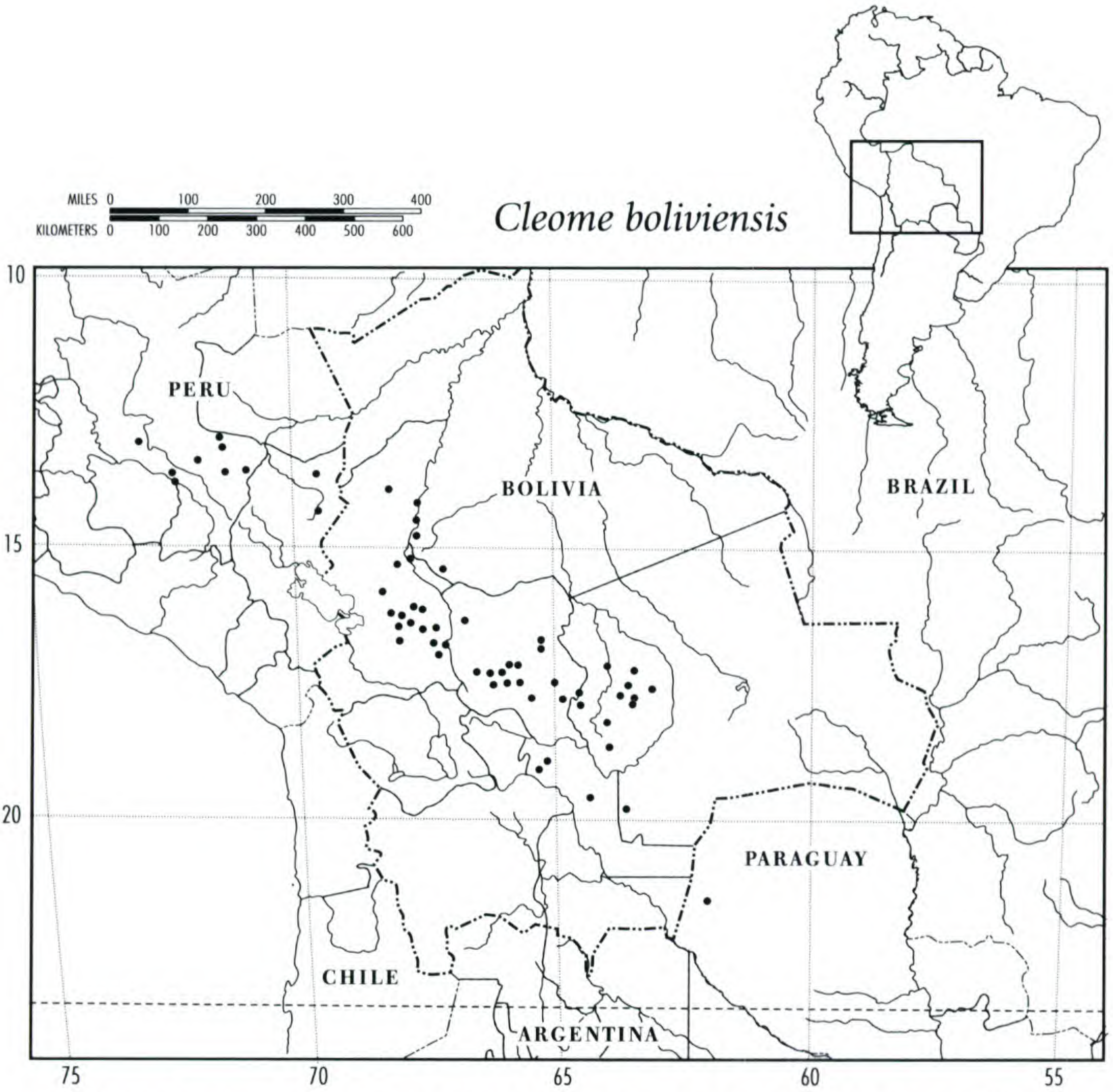

Figure 3. *Cleome boliviensis*: geographic distribution. (The location of *Fiebrig 1375*, "Alto Paraguay 21°S," is questionable.)

"Pink Queen," "Spider Flower," or "*C. spinosa*" of American gardens, an allopatric native of swamps and riversides from northeastern Argentina and Uruguay to southeastern Brazil (Minas Gerais), and perhaps even to the extremely rare, giant-flowered, also allopatric *C. lilloi* S. A. Gómez (Gómez, 1953), native to the lowland swamps of the Chaco, from northern Argentina to Bolivia and Paraguay (Iltis, 1967, 1998). Very spiny specimens of *C. hassleriana* can be nearly indistinguishable from *C. boliviensis*, but have, as a rule, fewer spines and less pubescence, 5 to 9 thinner, larger and more pointed, long-acuminate leaflets, deeper-colored pink to purple flowers (except for an occasional cultivated albino), and are less-branched, more herbaceous, annuals. Most significantly, *C. hassleriana* has totally glabrous petals, ovaries, and fruits, and larger seeds (mostly 2–2.3 mm) that always lack the minute oil-inflated bulliform cells on the cleft-membranes (use 20× lens) that are so characteristic of *C. boliviensis*. In contrast to the lowland, riverine *C. hassleriana*, *Cleome boliviensis* is a much more xeromorphic perennial or short-lived shrub of the seasonally dry Bolivian and southern Peruvian mountains, glandular throughout, including the siliques, though it, too, may grow on streamsides or sometimes, at lower elevations, as a weed in wet ditches.

Some *Cleome* Problems in Bolivia

Bolivian species with which *Cleome boliviensis* may be confused, especially when in flower, include the following:

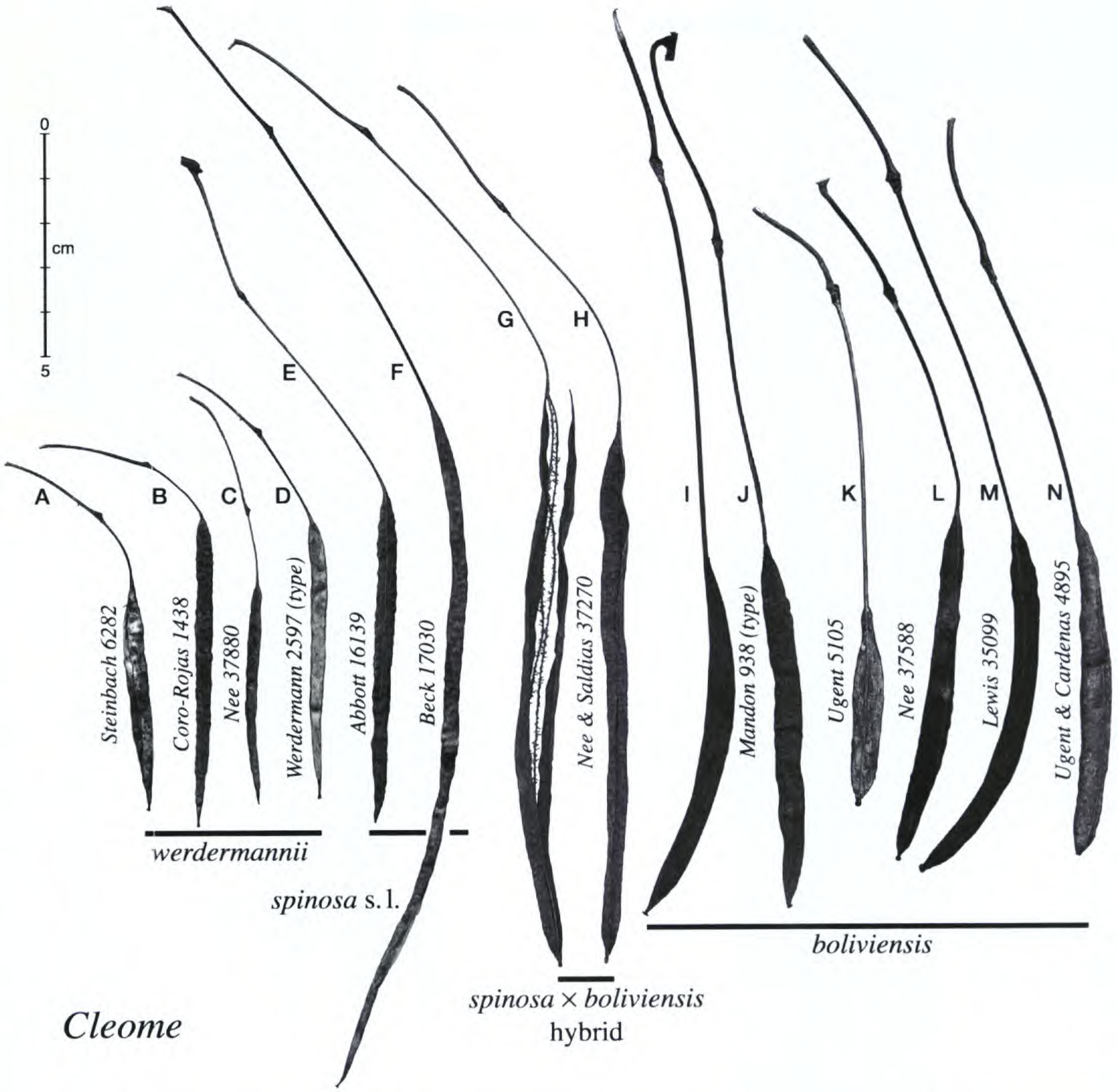

Figure 4. *Cleome boliviensis* and related Bolivian taxa: mature siliques, each showing (from top) pedicel, receptacle, gynophore, and silique [all to same scale; siliques from asterisked (*) herbarium]: *Cleome werdermannii* Ernst. —A. *Steinbach 6282* (A, G-DEL, K*), Santa Cruz, Cercado. —B. *Coro-Rojas 1438* (LPB, WIS*), Tarija, Bermejos. —C. *Nee 37880* (CAS, K, LIL, MA, MO, NY, WIS*), Santa Cruz, W-side of the city. —D. *Werdermann 2597* (B, MO*, S), Santa Cruz, Misiones Guarayos. —E. *Cleome spinosa* s.l., *Abbott 16139* (BEREA, MO, USZ, WIS*), from San José de Chiquitos, a peculiar population of *C. spinosa* with strigose, eglandular pubescence (see text). —F. *Cleome spinosa* s.l., *Beck 17030* (LBP, WIS*), Pando, Cobija, a weedy recent introduction into Amazonian lowlands (see text). —G, H. Hybrid or introgressant of *Cleome boliviensis* with *C. spinosa* s.l., *Nee & Saldias 37270* (NY, WIS*). I–N. *Cleome boliviensis* (see text; for all, WIS*). —I, J. *Mandon 938* (the holotype). —K. *Ugent 5105*. —L. *Nee 37588*. —M. *Lewis 35099*. —N. *Ugent & Cárdenas 4895*.

1. The rather uncommon white-flowered and spiny *Cleome werdermannii* Ernst is a Bolivian endemic of low and mid elevations (300–1600 m) that has small, essentially glabrous, smooth and narrow siliques (Fig. 4A–D), long-attenuate from far below the middle, that are sharply deflexed on a quite short, ± curved, gynophore (only 12–25 mm long). Its slightly tubercled seeds are somewhat larger than those of *C. boliviensis* and lack caruncular, bulliform cells. *Cleome werdermannii* is evidently related to the widespread, polymorphic *C. spinosa* s.l. complex, perhaps to some Central American types, and does not seem to introgress with *C. boliviensis*.

2. White-flowered *Cleome spinosa* of certain common, long-fruited, and torulose phenotypes of northeastern and central Brazil have recently become introduced in forested Amazonian lowlands

near the Brazilian border [e.g., Bolivia: Pando, Cobija, *Beck 17030* (LPB, WIS), *Fernández-Casas 8053* (MA, MO, NY, photocopies WIS)]. Aside from the enormously long fruits, to 15–17 cm (Fig. 4F), they differ in their larger seeds devoid of minute bulliform caruncular cells.

2a. One collection each from the Bolivian Departments of Santa Cruz (*Nee & Saldias 37270*, NY, WIS; Fig. 4G, H) and Cochabamba (*Holliday 67*, K) suggests interspecific hybridization with *C. boliviensis* by repeated putative backcrossing to these long-fruited *C. spinosa* phenotypes. The first of these, a glabrous specimen, has the long (13–14 cm), hanging siliques (Fig. 4G, H) typical of the Brazilian *C. spinosa* mentioned above, yet has seeds with abundant caruncular bulliform cells typical of *C. boliviensis*.

3. Some sporadic and puzzling specimens from northwestern Peru and southeastern Ecuador are problematic [e.g., Peru: Department Tumbes, Zarumilla, quebrada Faical, *D. R. Simpson & Schunke 559* (F, NY, US); Dept. La Libertad, Trujillo, Barrazu, *A. Sagastegui 7879* (GH, F, K, MO, NY). Ecuador: Prov. El Oro, Zaruma, El Calvario, *C. Bonifaz & X. Cornejo 3686* (GUAY, WIS); Prov. Loja, Macara, *G. Harling & L. Andersson 22539* (GB, WIS); Zambi, *F. Vivar 2816* (AAU, LOJA, photocopy WIS)]. They grow in irrigation ditches and nearby desert areas, edges of towns and waste places, and have in the past been misidentified by me as *Cleome boliviensis*. With better recent collections available, it became clear that most lacked the distinctive caruncular bulliform cells on their seeds, but that others had eglandular hispid pubescence mixed with shorter, glandular hairs unique in the polymorphic *C. spinosa* complex. These may thus represent a local variant ecotype or mutant rarely collected and as yet unnamed (Iltis & Cornejo, unpublished), while others may yet prove to be *C. boliviensis* or weedy *C. spinosa* or *C. hassleriana* Chodat, recently introduced near Guayaquil, Ecuador, or simply the variable offspring of a hybrid swarm between these species.

4. Two separate collections with very similar pubescence, cited in detail below (*Abbott 16139* and *Jardin & Mamani 3698*), have recently turned up far away in eastern Bolivia, both from San José de Chiquitos, growing in roadside ditches and marshy areas. This old, small town, a railroad stop in a vast, arid plain, is, according to Michael Nee (pers. comm.), characterized by a hot and seasonally dry climate resembling somewhat that of the forested coastal plain to the west and north of Guayaquil, Ecuador. Superficially, these plants look like hundreds of other *C. spinosa* collections, were it not for their unique, dense, closely appressed, strigose and totally eglandular pubescence, one that somewhat resembles that of the Pacific coastal plain desert plants mentioned above, but even more so, especially on the young inflorescences and sepals. In addition, Abbott's collection has mature siliques (Fig. 4E) with seeds 2.3 mm in diameter, which distinguish themselves by a pronounced scruffiness of relatively large, dried and collapsed blisters on their backs, much larger and more pronounced than those sometimes found on the seeds of *Cleome spinosa*, and quite unlike the minute ones on the seeds of *C. boliviensis*. Are these distinctive plants indeed recent weedy immigrants from the Peruvian coast, or in fact members of a local autochthonous endemic that, geographically and ecologically isolated, speciated allopatrically in this ecotonal border town between the *Chaco* (mineral-rich, recent alluvial soils derived from the Andes) and the *Cerrado* (nutrient-poor soils derived in situ from the pre-Cambrian Brazilian shield; Michael Nee, pers. comm.)? Whether endemic or not, these are questions that need, above all, intense fieldwork and many additional collections to be answered. [Bolivia: Santa Cruz, Chiquitos Province: suffrutescent herb to ca. 2 m tall, petals light whitish purple, filaments purple (siliques 6–7.5 cm long, narrowly torulose, on slender gynophores 5–6 cm long), San José de Chiquitos, ca. 3 km W of town square; roadside ditch and marshy area, 17°49′S, 60°44′W, ca. 500 m, 6 Feb. 1995 (fl, fr), *Abbott 16139* (BEREA, MO, USZ, WIS); hierba de 1.5 m, flores blancas-rosadas claro con olor dulce, 2 km E de San José de Chiquitos, yendo hacia Roboré del pozo del agua con *Ludwigia*, *Tessaria* [*integrifolia*], suelos arcillosos, 18°19′S, 60°63′W, 200 m, 15 Nov. 1996 (fl), *Jardin & Mamani 3698* (MO, WIS)].

5. Finally, I have seen a half dozen perplexing collections of *Cleome boliviensis* from Madre de Dios in southern Peru [e.g., *Plowman & Davis 5088* (WIS)], which have narrower, somewhat torulose siliques and smaller white flowers, thus resembling *C. parviflora* HBK subsp. *psoraleifolia* (DC.) Iltis (based on *C. psoraleifolia* DC., Prodr. 1: 239. 1824), yet have very small seeds (1.5 × 1.4 mm) with well-developed bulliform cells. That most of them are reported as weedy suggests hybridization with *C. boliviensis*, a problem that, like many others here, needs study.

Biogeography and Taxonomy

The three large-flowered southern South American endemics, *Cleome hassleriana*, *C. lilloi*, and *C. boliviensis*, constitute a series of geographically re-

placing ranges from southeastern Brazil, Paraguay, and northeastern Argentina west to southern Bolivia and Peru (Iltis, 1967: 961, fig. 6; Iltis, 1998: 438, fig. 5) and suggest a clade that evolved from a single southern South American ancestor by allopatric speciation. Furthermore, this clade seems to be ancestral to two other, geographically very distant and highly restricted, local endemics: the annual swamp-dwelling *Cleome chapalaensis* Iltis (Iltis, 1998) of the Lago Chapala basin of southwestern Mexico (*Cleome "pringlei"* [ined.] of Iltis, 1967: 961, fig. 6); and the extremely rare local endemic of the Dominican Republic, *Cleome domingensis* Iltis (a renaming of *Cleome erosa* Urban, 1912, not *Cleoma erosa* (Nuttall) Eaton, 1836, which is *Polanisia erosa* (Nuttall) Iltis, 1958; cf. Iltis, 1958). Since both species grow in wet habitats similar to those of *C. hassleriana* and *C. lilloi* and at geographically equivalent latitudes but north of the equator, one may assume that they developed their macro-disjunctions by avian long-distance dispersal (Carlquist, 1966, 1981; Iltis, 1967; Raven, 1963), a view supported by recent molecular analysis (Sánchez, 2002).

Whether the West African swamp and riverside *Cleome afrospina* Iltis (Iltis, 1967), the only indigenous Old World species of section *Tarenaya*, is derived from the same New World clade or another, closely related one (e.g., *C. trachycarpa* Klotzsch ex Eichler), again no doubt by avian long-distance dispersal (Iltis, 1967), awaits future molecular studies. In any case, *C. hassleriana*, *C. boliviensis*, and *C. chapalaensis* all have the same number of chromosomes ($n = 10$, $2n = 20$), as does the polymorphic *C. spinosa* s.l. of Central America, the West Indies, and South America north of Bolivia (Kawano & Kowal in Iltis, 1998; Costa e Silva, 2000; Iltis, Kawano, Kowal, Pazy & Pzywara, unpublished). Yet only *C. boliviensis*, among all these taxa, exhibits the unique glistening bulliform cells on its small seeds (see below), a specialization putatively related to dispersal by ants, and one suggesting autochthonous evolution in situ of this interesting species.

Ants, Arils, and Seed Structure in the Cleomaceae

Seed structure in the Cleomaceae is of great diagnostic value (Iltis, 1952, 1967; Ruiz-Zapata & Escala, 1995; Ruiz-Zapata, 1995; Sánchez, 2002), and myrmecochory, suggested by the presence of usually oily appendages as food for ants, is of special interest.

Various specializations for ant dispersal are found in the seeds of several groups of Cleomaceae. Some are related to each other, others not, these evidently having arisen independently at least seven times: (1) Small, light-reflecting, oil-containing, inflated caruncular cells at the mouth of the seed cleft and on the cleft membranes, one of the main diagnostic characters of *C. boliviensis*, suggest that these seeds are ant dispersed. (2) The cluster of some five taxa centering on *Cleome rosea* Vahl s.l. (Iltis, 1952; Costa e Silva, 2000; Iltis, in prep.), a group of ca. seven eastern Brazilian taxa that vary from spinose to, rarely, unarmed, and form a closely interrelated complex in section *Tarenaya* only distantly related to *C. boliviensis*, have bulliform cells on the strongly transversely rugose seeds, that, somewhat different from those of *C. boliviensis*, most probably arose independently by convergent evolution. (3) Bulliform cells almost identical to those that cover the cleft membranes connecting the two seed claws of *C. boliviensis* occur only in one other annual species of *Cleome*, a member of a group of three ebracteate unarmed species, probably belonging to *Tarenaya* (Iltis, 1952), namely the glabrous, spineless *C. paludosa* Willdenow ex Eichler of lowland northern Argentina, Uruguay, and southern Brazil, this surely again a case of convergent evolution. To prove the point, and most curiously, such cells are totally lacking in its closely related sister taxon, the common and weedy annual *C. serrata* Jacquin of Central America, the West Indies, and northern South America, a species which, except for the total absence of bulliform cells on its seeds, differs from its southern South American relative only by the lack of an elongated gynophore (Iltis, 1952, 2001). (4) Quite different and more prominent are the large, white, spongy funicular arils, so-called elaiosomes (Bresinsky, 1963), which occur in the spiny, weedy, and widespread tropical American *C. aculeata* L. of section *Tarenaya* s.l. and its several tropical South American relatives (Iltis, 1952; Ruiz-Zapata & Escala, 1995; Ruiz-Zapata & Iltis, 1998; Costa e Silva & Iltis, in prep.). (5) Independently evolved, although similar in appearance, are the white arils of the unarmed, weedy Old World *C. rutidosperma* DC. of section *Rutidosperma* Iltis (Iltis, 1960: 287, fig. 1; Jacobs, 1960; Ruiz-Zapata & Escala, 1995), which unlike the New World aculeata group has a quite open seed cleft. (6) Similar to the spongiform funicular arils of *C. aculeata*, but undoubtedly independently evolved as well, and for the third time, are the generically characteristic and prominent funicular arils of the 26 species (Cochrane, 1997) of the annual to perennial, herbaceous to woody New World genus *Podandrogyne* Ducke (Woodson,

1948; Iltis & Cochrane, 1989; Cochrane, 1977, 1978, 1997), which may have had their origin in (7) the quite inconspicuous small (funicular?) aril that projects from the very tip of the radicular claw of the seeds of the widespread, low-elevation annual *C. pilosa* Bentham, which, it so happens, is clearly related, albeit distantly, to *Podandrogyne* (Iltis, 1952; Iltis et al., 2005; Iltis & Cochrane, 1989; Ruiz-Zapata & Iltis, 1998: 151) as verified by morphological assessments and recent molecular studies (Hall et al., 2002: 1830; Sánchez, 2002).

Paratypes. ARGENTINA. **Corrientes:** Parque Dutre., *Pedersen 177* (P) [probably cultivated in a city park]. BOLIVIA. Prov. unknown: Vinto, *W. M. A. Brooke 5018* (BM, F). **Beni:** Distr. Ballivian, Serranía de Pilón Lajas, Bosque Montañoso, al borde de camino, San Borja, 75 km hacia La Paz, *St. G. Beck 6987* (WIS); La Cumbre, *Beck 13251* (WIS); vertiente oriental, 21 km de Yucumo, *D. N. Smith, G. Quintana & V. García 13202* (LPB, MO, WIS). **Chuquisaca:** Distr. Oropeza, rocky roadside, base of cliff, 16 km NE of Sucre on Aiquile Rd., *D. Ugent & M. Cárdenas 4895* (IBUG, MY, QCA, WIS); Distr. Tomina, Musuru (16 km de Padilla), rumbo a Monteagudo, *C. Saravia 11156* (CTES); Sucre, open, stony, dry slopes, *E. K. Balls 6187* (DAB, E, K, NA, UC, US); des ravine de Velco mayo [sic! = Pilcomayo?] près Chuquisaca, *A. D'Orbigny s.n.* (P); Distr. B. Baleto, 700 m N of town square of Nuevo Mundo, on road to Villa Serano, then 300 m left (downhill) of road, *D. M. Spooner, R. G. van der Berg & M. L. Ugarte 6786* (WIS). **Cochabamba:** Cervecería Colón, Cochabamba, in a stony bed of a mountain stream, *Balls 6205* (E, UC, US); Tunari, *K. Graf 521* (NY); 20 km E of Cochabamba, among stones, thickets on riverbank, *W. J. Eyerdam 24752* (F, K, NA); 2 km N of Cochabamba, *Ugent 4593* (P, U, US, WIS); Tiquipaya, 10 km N of Cochabamba, *Ugent 5003* (LIL, UC, WIS); Distr. Carrasco, Cochabamba 142 km from Cochabamba at Santa Cruz, *Beck 6830* (WIS); roadside thickets, km 180 on Cochabamba–Sta. Cruz road between Duraznillo & Challuani, *Ugent 5105* (G, K, NY, UC, US, WIS); rock wall crevice, Tutimayo, 25 km E of Cochabamba, *Ugent 4643* (GH, K, SMF, WIS); Río Mizque, Mizque [riverside thickets], *C. Troll 1464* (B, M); Tako-Tako near Mizque, *Brooke 5916* (BM, F, NY); stony valley near stream, Cochabamba, *T. G. Tutin 1612* (MO); Liriuni, *R. Scolnik & R. Luti 599* (SI, WIS); Distr. Ayopaya, cuenca Río Tambillo, Independencia, *R. Baar 223* (LPB, WIS); San Benito, 44 km de Cochabamba a Sta. Cruz, *J. Fernández-Casas 7721* (MA, MO, NY); La Maica, *M. Cárdenas 3440* (S, US); Prov. Carrasco al borde de camino y de las chacras, Cochabamba, km 142 hacia Sta. Cruz, Prov. Carrasco, *Beck 6830* (WIS); valle de Cochabamba, *J. Steinbach 8741* (BM, F, G, GH, IM, K, M, NY, PH, S, U, UC, US, Z); Tunari, *R. F. Steinbach 117* (DAV, GH, MO, NY, UC, WIS); progeny of seeds collected in Cochabamba (grown in Washington, D.C.), *R. M. King & L. E. Bishop 7716* (B, IBUG, K, MARACAY, MEXU, QCNE, TEX, UB, US, USM, WIS); Cochabamba, *O. Buchtien 2371* (NY, US); Pairumani, *Musch 16* (SI). **La Paz:** Abel Iturralde Distr., lado de carretera en la banda del Río Tekeje, a 10 km de Ixiamas, Ixiamas Tacana, *G. Bourdy 2771* (IRD, LPB, UMSA, WIS); delta que forman el arroyo Arana y el Río Tuichi, pozo Yariapo X-1, *B. Kuno 353* (LPB, WIS); Distr. Inquisivi, Inquisivi, 3 km hacia Circuata, *Beck 4477* (WIS); 4 km SE of Inquisivi, *M. Nee 37588* (NY, WIS), *M. Lewis 35099* (LPB, MO, WIS); Río Sara at Rancho Cuesta Sara, Inquisivi, *Lewis 882007* (LPB, MO, WIS); Distr. Nord-Yungas, Milliquaya, *Buchtien 4330* (US); Hacienda "El Choro," Coripata, *Buchtien 8092* (NY, US); Isapuri, *D. E. Williams 684* (NY, US); Río Palca valley, Mt. Illimani, *B. Julio 110* (C, US); Coroico, *J. Solomon, B. Stein & M. Uehling 12066* (MO, WIS 2 sheets); forest edge on bank of Río Beni, 20 km upstream from Rurrenabaque, *L. G. Holliday 60, 67* (K); Rurrenabaque, mossy boulders near river, *D. C. Daly et al. 6638* (NY, WIS); Reyes, Rurrenabaque, Río Beni, *Fleischman 476* (S); brecha 22, heliport 14, Río Tuichi, *A. Fournet 489* (WIS); 12 km along Río Santa Bárbara, below Yolosa, rd. to Caranavi, *Solomon 8898* (MO, WIS); Distr. Sud-Yungas, Arroyo San Antonio, bajando la Concesión Tropical (ribera del río), Alto Beni, *E. Vargas, R. Seidel & L. Cruz 2230-A* (LPB, WIS); Inicua, *O. M. R.(ERTS) 373* (WIS); rd. to Chulumani, 23 km E of Unduavi, *T. B. Croat 51534* (MO, WIS); El Chaco, Valle de Unduavi, *A. Lourteig 2625* (P); Cañamina, *H. H. Rusby 66* (BKL, NY); Valle del Río Unduavi de la escuela de Sirupaya por abajo *R. Seidal & E. Richter 1250* (WIS); Sirupaya near Yanacachi, *Buchtien 566* (F, G, GH, NY, US, W); Cotaña, am Illimani, *Buchtien 3173* (NY, US); dry rocky soil on roadside 21 km W of Puente Villa & 26 km E of Unduavi, *C. Davidson 5003* (RSA); Puente Villa 2 km arriba del Río Tamanpaya, *Beck 17781* (LPB, WIS); rd. to Puente Villa, 5 km W of Chulumani, *D. M. Spooner, R. G. van den Berg & W. García 6734* (LPB, WIS); lowland forest along Río Satariapo, 12 km SW of Ixiamas, *A. Gentry & R. Foster 70883* (WIS); [probably La Paz] Yungas, 1890, *M. Bang 485* (C, G, LD, LE, LIL, M, MO, NDG, NY, PH, R, US, W, WIS, Z). **Santa Cruz:** roadside between Santa Cruz–Cochabamba, km 240, *W. J. Badcock 468* (K [an exceptionally spiny plant]); Manuel Maria Caballero Distr., ladera con bosques ralo, cerca de Comarapa en dirección a Epizana, *Fernández-Casas 7901* (MA, MO, NY); Bachraender [borders of creek], Samaipata, *C. Troll 1063* (B); bosque montañoso con poco influencia humana, Prov. Cordillera, Caraparicito, 40 km de Camiri, *R. de Michel 181* (WIS); 35 km de Camiri, *Michel 65* (WIS); Distr. Vallegrande, low, semideciduous forest, 10 km E of Guadaloupe, valley of Río Piraymiri, "Juntas de Guaricongas," *M. Nee, P. Bettella & M. Saldias 36194* (LPB, NY, WIS); 5 km WNW of Comarapa on road to Catalinas, *D. Ugent & V. Ugent 5112* (B, UC, WIS). **Sara** [now Prov. Ichilo]: Cerro de Amboró, playitas arenosas del Yráma, *J. Steinbach 2971* (GH, LIL, NY, SI); San Ignacio, *J. Steinbach 3537* (G, GH, K, LIL, SI); Distr. Ichilo, Parque Nacional Amboró, tropical evergreen forest, sandy edges of Río Saguayo, 1 km downstream from Quebrada Yapojé, *Nee 38152* (NY, WIS); evergreen tropical lowland forest along Río Moile, opposite Campamento Moile, 6 km SW of Villa San German, *M. Nee & E. Chávez 51613* (NY, WIS); Río Saguayo, *Nee & Saldías 37270* (NY, WIS). PARAGUAY. **Chaco:** Alto Paraguay, *Fiebrig 1375* (Z) [this location is questionable]. PERU. **Cuzco:** Distr. Cuzco, Camisea, Campamento Armihuari, *P. Acevedo-Rdgz. 9230* (NY, US, WIS); Anta, El Chaccan, *Brunel 584* (MO, WIS); Cillapuyu, El Chaccan, *Brunel 359* (MO); Distr. Convención, Amaibamba, Liucumayo, *C. Vargas 4562* (WIS); Distr. Echarate, Armihuari Well Site, *P. Núñez & Beltrán 19863* (US, WIS); Distr. Paucartambo, Atalaya, hillside & riverside, jct. Río Carbón with Río Madre de Dios, *R. Foster 3037* (US); abierta pedregoso, Pilcapata, La Raya, *Vargas 11320* (CUZ, WIS); arenoso, cerca al río, Atalaya-Kosñipata, *Vargas 13987* (WIS); Distr. Quispicanchis, Tío-San Pedro, *Vargas 9730*

(A, CUZ, WIS); ruderal, Chili-Chili, *Marin 2436* (LIL); borde camino, en lugares abicotos, Murayaca, Marcapata, *Vargas 3756* (LIL, MO); Quince Mil, *Vargas 7772* (MO). **Madre de Dios:** Distr. Manu, rd. from Shintuya to Salvación, *T. Plowman & E. W. Davis 5088* (GH). **Puno:** Distr. Sandia, Sandia, *L. Hoogte & C. Roersch 3447* (MO); trail from Aricoma Pass to Sto. Domingo, *D. McCarroll 59* (CUZ, MICH).

Acknowledgments. I wish to thank my former student, master ethnobotanist and potato specialist Donald Ugent, Professor Emeritus of Botany, Southern Illinois University–Carbondale, for collecting the excellent series of *Cleome boliviensis* populations in 1963; Lupita Sánchez for help with the Bolivian specimen citations; our Botany Department artist, Kandis Elliot, for her careful work on the illustrations; Luz María González for translating the abstract into Spanish; Barbara Neuffler and an anonymous botanist for carefully reviewing the manuscript; Barbara Schaack, Liz Lipsett, Xavier Cornejo, and Josh Sulman for dependable and cheerful help with my manuscript; and especially Victoria Hollowell, Michael Nee, and Theodore S. Cochrane for the exemplary care with which they whetted the final manuscript to perfection.

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Carex hangzhouensis and Section *Hangzhouenses*, a New Species and Section of Cyperaceae from Hangzhou, Zhejiang, Eastern China

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ABSTRACT. *Carex hangzhouensis* C. Z. Zheng, X. F. Jin & B. Y. Ding, a new species of Cyperaceae from eastern China, is described and illustrated, and the distinguishing characters are discussed. Owing to its peculiar habit, *Carex hangzhouensis* does not fit into an existing section. Therefore, based upon this type, the new *Carex* sect. *Hangzhouenses* is identified, and a key to this and the related sections in eastern and southern Asia is provided.

Key words: *Carex*, China, Cyperaceae, section *Hangzhouenses*, Zhejiang.

Carex L. is the largest genus within the family Cyperaceae. The genus is cosmopolitan with over 2000 species distributed in various habitats (Nelmes, 1951; Ohwi, 1953; Dai et al., 2000). China has nearly 500 species of *Carex* (Dai et al., 2000). During the course of collecting and identifying *Carex* specimens collected in Zhejiang, new records, new species, and new varieties have been discovered (Zheng, 1989, 1993; Jin et al., 2003, 2004a, 2004b). Among the specimens of *Carex* collected in 1978 and 1986 in Hangzhou City, Zhejiang Province, some specimens are peculiar in their spike arrangement. However, the perigynia of these specimens are immature. We repeatedly attempted to find mature specimens at the type locality, Lingyin, Hangzhou City, and were finally successful in May 2003. Compared with other species of the genus, specimens with mature perigynia have a subracemose panicle, a terminal staminate spike, the lateral branched spikes arising from a utriculiform cladoprophyll with a single pistillate flower (a perigynium), and a unique achene shape.

All these features distinguish the taxon from other sections in *Carex* subg. *Indocarex* Baillon (Clarke, 1904; Kükenthal, 1909; Ohwi, 1936; Nelmes, 1951; Dai et al., 2000). Therefore, we identify the taxon as a new species and establish a new section based on it.

Carex sect. **Hangzhouenses** C. Z. Zheng, X. F. Jin & B. Y. Ding, sect. nov. TYPE: *Carex hangzhouensis* C. Z. Zheng, X. F. Jin & B. Y. Ding.

Haec sectio *Carici* sect. *Mundae* affinis, sed ab ea inflorescentiis subracemoso-paniculatis, spica terminali staminata basi eramosa, spicis secundariis lateralibus ex cladoprophyllo saccato florem pistillatum solitarium evolutum gerente ortis, perigynio apice in rostrum curvum ore bidentatum contracto atque achenio apice in rostrum curvum brevem abrupte contracto differt.

Bracts shortly foliaceous, long vaginate; sheaths smooth, 1.5–2.5 cm long. Panicle subracemose; terminal spike staminate, long pedunculate, base of the staminate spike unbranched; lateral secondary inflorescences 1 to 3, racemose, each with 6 to 10 closely branched spikes, androgynous. Branched spikes arising from a sacculate cladoprophyll with a single developed pistillate flower. Perigynia glabrous, trigonous, multinerved, apex with a geniculate, bidentate beak. Achenes trigonous, concave on lateral surfaces, apex retuse with short persistent style base, base with vestigial rachilla.

The new species is distinguished within *Carex* by its lateral branched spikes arising from a sacculate cladoprophyll with a single developed pistillate flower. The laterally concave achene shape uniquely distinguishes the taxon. In particular, *Carex hangzhouensis* may be contrasted with other species in *Carex* sect. *Mundae* Kükenthal and sect. *Japonicae* Kükenthal, which are postulated as its closest putative relatives. Species in *Carex* section *Mundae* differ in their racemose inflorescences terminated by androgynous spikes as well as symmetrical perigynia with erect beaks that are neither dentate nor toothed. Species in *Carex* sect. *Japonicae* have spicate inflorescences with terminal androgynous spikes. Perigynia are symmetrical and have straight beaks, and the beaks are obliquely truncate. Characterizing the new species, the peri-

gynia of *Carex hangzhouensis* are asymmetrical, with a geniculate beak to 2 mm long. This beak is bidentate, with teeth evident, to ca. 5 mm long.

This new section is currently monotypic, distributed in Hangzhou, Zhejiang Province, eastern China.

Carex hangzhouensis is the sole species of its section, but shares its fertile cladoprophyll character with five species in eastern and southern Asia, namely, *C. satsumensis* Franchet & Savatier, *C. munda* Boott, *C. fragilis* Boott, *C. dissitiflora* Franchet, and *C. yulongshanensis* P. C. Li. *Carex satsumensis* belongs to section *Japonicae* and the other four species belong to section *Mundae* Kükenthal (Kükenthal, 1909; Ohwi, 1936; Nelmes, 1951; Li, 1990; Dai et al., 2000).

Species of the other sections of *Carex* subg. *Indocarex* differ in that they have lateral spikes extending from a sterile (empty) cladoprophyll (Nelmes, 1951). A key to the above-mentioned sections follows:

KEY TO *CAREX* SECT. *HANGZHOUENSES* AND RELATED SECTIONS IN EASTERN AND SOUTHERN ASIA

1a. Inflorescence spicate; spikes densely arranged; bracts unsheathed . . . . . sect. *Japonicae*
1b. Inflorescence racemose or paniculate; spikes loosely arranged; bracts long sheathed.
  2a. Inflorescence racemose, terminal spike androgynous, base branched; perigynia symmetrical, with a smooth, erect and truncate beak; achenes not concave on lateral surfaces . . . . . sect. *Mundae*
  2b. Inflorescence paniculate, terminal spike staminate, base unbranched; perigynia asymmetrical, with a scabrous, geniculate and bidentate beak; achenes concave on lateral surfaces . . . . . sect. *Hangzhouenses*

Carex hangzhouensis C. Z. Zheng, X. F. Jin & B. Y. Ding, sp. nov. TYPE: China. Zhejiang: Hangzhou City, Lingyin, Feilaifeng Mt., on rocks in forests, 50 m, 30°14′26″N, 120°05′56″E, 13 May 2003, *X. F. Jin & F. J. Wu 0702* (holotype, HZU; isotype, PE). Figure 1.

Haec species *Carici yulongshanensi* affinis, sed ab ea inflorescentiis secundariis quaque ex spicis secundariis 6 ad 10 constante, squamis staminatis oblongis ca. 8 mm longis, pistillatis late ovatis ca. 8.5 mm longis 3-nervis glabris apice in aristam ca. 3 mm longam desinentibus.

Herbs perennial; rhizomes short; culms densely caespitose, 30–60 cm tall, tenuous, trigonous, glabrous. Leaves longer than culms, plane or margins involute, 2.5–4 mm wide. Bracts shortly foliaceous, shorter than inflorescences, long vaginate; sheaths smooth, 1.5–2.5 cm long. Panicle subracemose; secondary inflorescences 1 to 3, racemose, lateral; terminal spike and uppermost secondary inflorescence binate, others solitary. Terminal spike staminate, clavate, 4–5.5 cm long, peduncle 3.5–7 cm long; each secondary inflorescence with 6 to 10 closely branched spikes; branched spikes androgynous, arising from a sacculate cladoprophyll with a single developed pistillate flower, terminal staminate spike 1.5–2 cm long, much longer than lateral spike; lateral spike apex with 4 to 6 staminate flowers, pistillate spike with a single perigynium. Lowermost peduncle to 8 cm long. Staminate scales oblong, ca. 8 mm long, membranous, stramineous, apex obtuse, mucronate; pistillate scales broadly ovate, ca. 8.5 mm long, subcoriaceous, green, 3-veined, glabrous, apex acuminate, shortly aristate; arista 3 mm long. Perigynia obovoid, obtusely trigonous, 6.5–7 mm long, brownish green, glabrous, multiveined, base attenuate, apex contracted with a geniculate beak; beak ca. 2 mm long, margin scabrous; teeth ca. 0.5 mm long, bidentate. Achenes ellipsoid to obovoid at maturity, subsessile, trigonous, castaneous, concave on lateral surfaces, 3.5–4 mm long, apex retuse with a short persistent style base; style base incrassate; stigmas 3; vestigial rachilla ca. 2 mm long.

Flowering and fruiting April–May.

This new species is similar to *Carex yulongshanensis* P. C. Li, from which it differs in having the inflorescence subracemose paniculiform, the terminal spike staminate, the base unbranched, each lateral secondary inflorescence base with 6 to 10 closely branched spikes, staminate scales oblong, ca. 8 mm long, pistillate scales broadly ovate, ca. 8.5 mm long, veins glabrous, apex aristate, arista 3 mm long, perigynia glabrous, beak bidentate, achenes concave on lateral surfaces, apex retuse with a short persistent style base.

Paratypes. CHINA. **Zhejiang:** Hangzhou City, Lingyin, Feilaifeng Mt., on rocks in forests, 30 m, 1 May 2003, *X. F. Jin & H. Wang 0657* (HZU 2 sheets), *0658* (MO), *0665* (HZU), *0666* (HZU), 18 Apr. 1986, *C. Z. Zheng 3913* (HZU), 1 May 2003, *H. Wang 0369* (HZU), *0371* (MO), 4 May 2003, *H. Wang 0378* (HZU 3 sheets), 13 May 2003, *X. F. Jin & F. J. Wu 0703* (HZU); Hangzhou City, Nangaofeng Mt., in forests, 5 Apr. 1978, *C. Z. Zheng s.n.* (HZU).

Acknowledgments. We express our gratitude to S. Y. Liang (CAS) and L. K. Dai (CAS) for continuous support and encouragement, to Victoria C. Hollowell (MO) and Amy McPherson (MO) for editorial help with the manuscript, to two anonymous reviewers for their comments, to F. J. Wu (CAS) for preparing the illustration, and to F. J. Wu (CAS) and H. Wang (ZBS) for kind help and collections.

Figure 1. *Carex hangzhouensis* C. Z. Zheng, X. F. Jin & B. Y. Ding. Drawn from the holotype and isotype (*X. F. Jin & F. J. Wu 0702*). —A. Habit of plant. —B. Pistillate scale, perigynium with style branches and staminate flowers exserted. —C. Staminate scale. —D. Pistillate scale. —E. Perigynium. —F. Achene. —G. Rachilla and perigynium.

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Passiflora xishuangbannaensis (Passifloraceae): A New Chinese Endemic

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ABSTRACT. *Passiflora xishuangbannaensis*, a new species endemic to Yunnan Province, China, is described and illustrated. It is distinguished from other members of *Passiflora* supersection *Disemma* by being completely glabrous, having one to two flowers per node, thickened coronal filaments that are brown to purple at the base, deeply bilobed leaves with strong variegation along the three primary veins, and a v-shaped arrangement of numerous abaxial laminar nectaries.

Key words: China, *Decaloba*, *Disemma*, *Passiflora*, Passifloraceae, Xishuangbanna, Yunnan.

Passiflora L. is a primarily Neotropical genus with more than 530 species worldwide. Of these, approximately 20 species are native to the Old World, primarily distributed throughout mainland India, China, Southeast Asia, Australia, and the Pacific (De Wilde, 1972). All of these species are placed in subgenus *Decaloba*, supersection *Disemma* (Labillardière) J. M. MacDougal & Feuillet. As part of a phylogenetic study of *Disemma*, fieldwork in Yunnan Province, China, was completed, and during the course of this research a new species was found. At the time of collection, all plants were sterile; cuttings were taken, and the plants have since flowered continuously in the Plant Biology Greenhouses at the Ohio State University, Columbus, Ohio, U.S.A. Descriptions of the flowers and fruit were made based on the cultivated material.

Passiflora xishuangbannaensis Krosnick, sp. nov. TYPE: China. Yunnan: Xishuangbanna, Jinghong County, N side of Da Du Gang Town near 2765 mile post on Hwy. 213, on side of trail in shady area near stream ca. 1.5 km E of Hwy. 213, mixed secondary forest and agriculture, 1200 m, 22°19.60′N, 100°58′E, 3 Mar. 2003, *S. E. Krosnick & H. Wang 254* (holotype, OS; isotypes, HITBC, KUN, MO, NY). Figure 1.

A *Passiflora altebilobata* planta glabra omnino, glandibus petioli dispositis prope laminam, foliis minus penitus bilobatis, nervo medio valde variegato, nectariis numerosis dispositis ad lineam sub angula 20° abeuntibus, inflorescentiis 1–2 floris, floribus grandioribus, filamentis incrassatis coronarum purpureo-brunneis basi differt.

Weakly tendrillate, clambering vines, 1–3 m long, glabrous throughout; stem subtriangular, 2.5–5 mm diam., new shoot growth straight. Leaves alternate; stipules 0.5–1 × 1 mm, lanceolate, sessile, margins entire, deciduous; petioles 1.5–2.5 cm long, often with two short-cylindrical, glandular nectaries in the distal quarter, the nectaries 1–2 mm diam., short-cylindrical to 1 mm long, the nectariferous surface borne terminally; lamina 4.5–8.5 × 2.5–5 cm, white-variegated adaxially along the three major veins, margins entire, the lateral lobes greatly exceeding the midvein, creating a sinus about half as long as the leaf, midvein mucronate, mucro 1–2 mm long, abaxial surface light green, often with purple venation near base of lamina, laminar nectaries 8 to 12(to 15), discoid and sessile, arranged in two lines divaricating at a 20° angle from the midvein and running partway down the lateral lobes. Two flowers per node, one flower sometimes aborting during maturation; pedicels 1.5–2 cm long, bearing 3 floral bracts; floral bracts linear, 1–2 mm long, sessile, alternate and three-ranked, 0.5–1 cm beneath the articulation. Flower buds sub-conic; flowers 3.2–3.8 cm diam. at anthesis, with 3–5 mm long stipe, orientation of flowers upward, petals and sepals completely reflexed at anthesis, smelling strongly of lye; sepals 16–18 × 5–7 mm, triangular-ovate, acute and rounded at apex, abaxial surface light green, strongly veined, adaxial surface white basally, green at apex, margins membranous; petals 10–12 × 2–3 mm, lanceolate, white; hypanthium 0.8–1 cm wide; coronal filaments in 2 series, outer series 1 cm long, with ca. 33 to 35 filaments, thickened, purple-brown in the basal third, the upper portion bright yellow, wide spreading at anthesis, inner series 5 mm long, with ca. 90 to 100 filaments, purple-brown with a yellow-capitate apex; operculum 3–4 mm high, plicate, green with purple striations; limen 5–6 mm diam., annular, green, purple at outermost edge; nectary yellow, 2 mm deep; staminal filaments con-

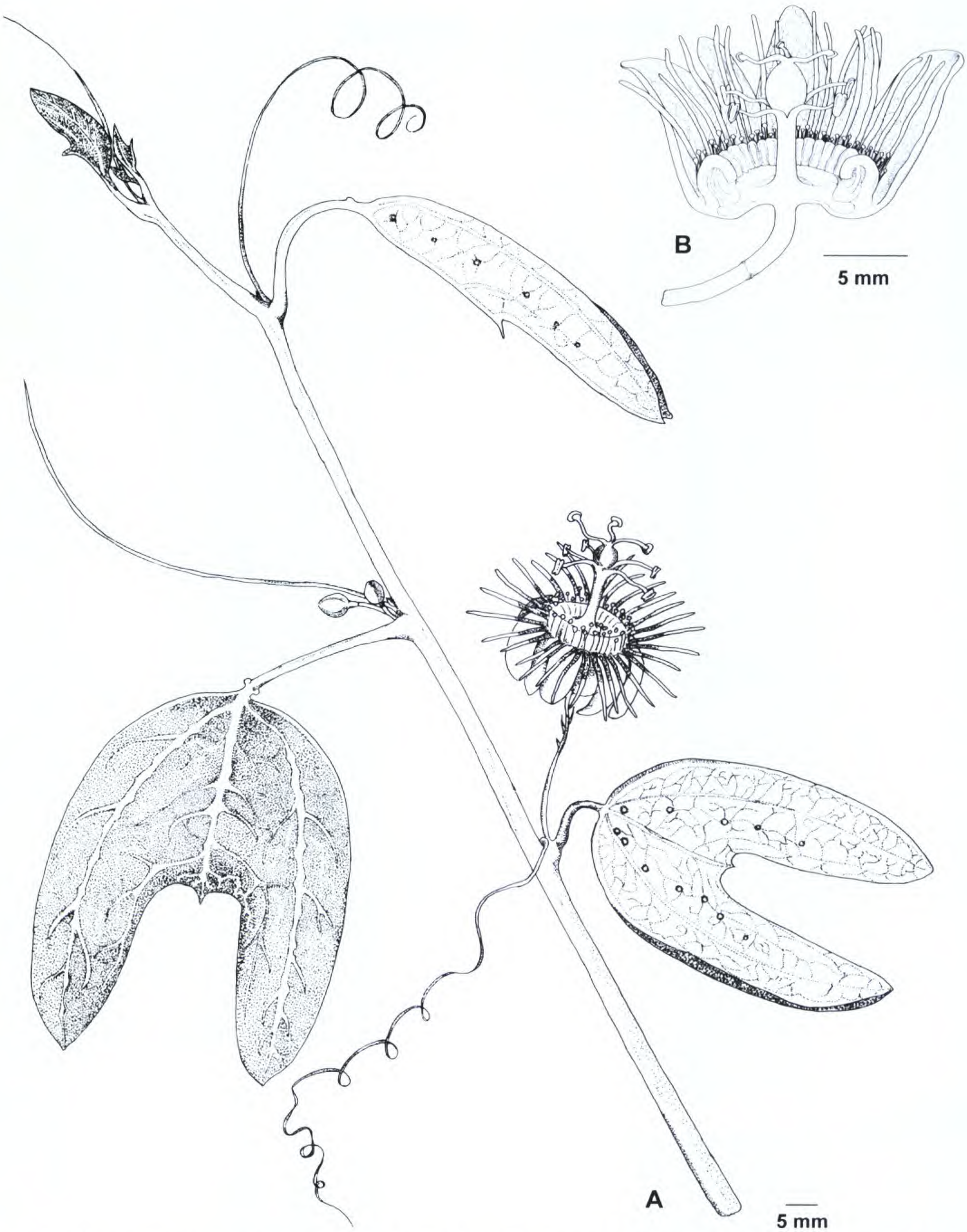

Figure 1. *Passiflora xishuangbannaensis* Krosnick. —A. Habit, shoot tip with buds and flower at anthesis. —B. Cross section of flower with detail of coronal filaments, limen, and operculum. Drawn by the author, from the holotype, *Krosnick & Wang 254* (OS).

nate, 5–7 mm along androgynophore, the free portions 5–6 mm long, flat; anthers 3–4 mm long, versatile, elongated with a small basal protrusion; ovary 4–6 × 2–3 mm, ellipsoid, subtriangular in transverse section, sessile on the gynophore, glabrous; styles 5–7 mm long including stigmas, stigma 1–2 mm wide, obliquely expanded at the apex, stigmatic surface papillate. Fruit 1.5 × 1 cm, ovoid, dark blue at maturity; arils yellowish orange, the distal margin fimbriate. Seeds 7 to 10 per fruit, 5–6 × 3–4 mm, 2 mm thick, obovate, foveolate-reticulate with 70 to 80 foveae per side.

Table 1. Characteristics distinguishing *Passiflora xishuangbannaensis* from *P. altebilobata*.

	P. xishuangbannaensis	*P. altebilobata*
Pubescence	glabrous	hirsutulous
Stem shape	subtriangular	round
Leaf variegation	present on all major veins of the lamina in both juvenile and adult leaves	limited mottling present on juvenile leaves, absent in adult leaves
Leaf shape	leaves strongly two-lobed with sinus 0.2–0.3 times the length of the lateral lobes	leaves strongly two-lobed, mid lobe truncate, sinus 0.3–0.6 times the length of the lateral lobes
Petiolar nectaries	sometimes absent; if present, paired, located in the distal quarter of the petiole	paired, located midway along the petiole
Abaxial laminar nectaries	8–12(–15), discoid, arranged at a 20° angle from the midvein	2(–4), paired near the apex of the midvein
Flowers per node	1–2	10–20
Flower diameter at anthesis	3.2–3.8 cm	0.75–1 cm
Coronal filaments		
Outer series	thickened to 10 mm, purple-brown at base, upper ⅔ yellow	thin to 5 mm, white throughout
Inner series	5 mm long, purple-brown with yellow-capitate apex	1 mm long, pale yellow with subcapitate apex
Fruit size	1.5 × 1 cm, ovoid	1 × 1 cm, round
Habitat	1200 m, sunny or shady, wet edge of forest	900 m, wet, shady, in dense forest

Phenology. Specimens not flowering in wild population at the time of collection (early March); flowering continuously in greenhouse conditions in Columbus, Ohio.

Etymology. The specific epithet is based on the unique area of endemism, the Xishuangbanna Prefecture, which encompasses three counties (Jinghong, Mengla, and Menghai) in Yunnan, China.

Discussion

Passiflora xishuangbannaensis was collected in Jinghong County in the Xishuangbanna Prefecture from one of three individual plants observed at the type locality. Upon later visits in 2003, two of the larger plants were noted to have disappeared. The habitat is sandy wet forest openings near streams in both sunny and shady locations, with agricultural fields bordering the opposite sides of the streams. The site of this collection is now under construction for a new highway and the forest may no longer be present. Thus, for conservation purposes, its status should be considered endangered. However, given the proximity of similar habitats in Mengla and Menghai Counties, it is possible that *P. xishuangbannaensis* may still be found there.

Passiflora xishuangbannaensis was not in flower at the time of collection. Cuttings were made for cultivation, and there was no observed difference between the vegetative aspects of the field-collected and cultivated material. The cultivated plants have flowered continuously throughout the year in the greenhouse; however, *Passiflora xishuangbannaensis* does not appear to be self-compatible. Hand pollination was performed using pollen from *P. xishuangbannensis* as well as other closely related species, including *P. cupiformis* Masters and *P. papilio* H. L. Li. All self-pollination events failed, whereas all out-crossed flowers set fruit. Viability tests of the seeds were not performed. Given the self-incompatibility observed in this species, the conservation of more than one haplotype is important.

Passiflora xishuangbannaensis is similar to the Yunnan native *P. altebilobata* Hemsley, but is easily distinguished by several morphological and habitat features (Table 1). *Passiflora xishuangbannaensis* is a weakly tendrillate, clambering herb, while *P. altebilobata* is a strong climber. *Passiflora xishuangbannaensis* is completely glabrous, whereas *P. altebilobata* is hirsutulous on the stems, leaves, and inflorescences. The abaxial laminar nectaries are arranged in a v-pattern in *P. xishuangbannaensis*, while in *P. altebilobata* there are two (to four) large, paired nectaries located near the apex of the midvein. Additionally, *P. xishuangbannaensis* has one- to two-flowered inflorescences, while *P. altebilobata* has 10 to 20 flowers per inflorescence. *Passiflora xishuangbannaensis* has larger and more colorful

flowers than *P. altebilobata*, which has pale green sepals, petals, and coronal filaments (Table 1).

The habitats of *Passiflora xishuangbannaensis* and *P. altebilobata* appear to differ: *P. xishuangbannaensis* is found in open, wet, sunny or shaded locations at 1200 m, whereas *P. altebilobata* is found at lower elevations, ca. 900 m, under dense forest in shaded areas. *Passiflora altebilobata* is also found most frequently northwest of Xishuangbanna, throughout Simao and Lin Cang Counties, whereas *P. xishuangbannaensis* is only found within Xishuangbanna.

Paratype. U.S.A. **Ohio:** Columbus, Ohio State University Plant Biology Greenhouse, in cultivation, *Krosnick 401* (OS).

Acknowledgments. Thanks to Hong Wang of the Xishuangbanna Tropical Botanical Garden for initially locating this new species and for subsequent assistance and collaboration during fieldwork to collect *P. xishuangbannaensis*, John Freudenstein for the Latin translation, John MacDougal, Peter Jørgensen, and Mesfin Tadesse for critical comments on the manuscript, and Joan Leonard for maintenance of the living collections. This research was funded by the Ohio State University Alumni Grants for Graduate Research and Scholarship, and the American Society of Plant Taxonomists Graduate Research Award.

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Isoetes orientalis (Isoetaceae), a New Hexaploid Quillwort from China

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ABSTRACT. *Isoetes orientalis* is a previously undescribed, rare, and endangered quillwort of southeast China with a hexaploid chromosome count of $2n = 66$. Megaspores of *I. orientalis* have a reticulate ornamentation consisting of irregularly anastomosing muri with ragged crests. Microspores have an echinate-tuberculate ornamentation. Herbarium specimens of *I. orientalis* previously have been misidentified as *I. sinensis*. *Isoetes orientalis* differs from *I. sinensis* in spore morphology and chromosome number.

Key words: China, East Asia, Isoetaceae, *Isoetes*, quillwort.

Three basic diploid species and one tetraploid species of *Isoetes* have been reported from China (Liu et al., 2002; Wang et al., 2002). These are *I. hypsophila* Handel-Mazzetti ($2n = 22$), *I. taiwanensis* DeVol ($2n = 22$), *I. yunguiensis* Wang Q. F. & W. C. Taylor ($2n = 22$), and *I. sinensis* Palmer ($2n = 44$). Over the last five years, field, herbarium, and laboratory studies have been conducted in the assessment of *Isoetes* populations over a large part of mainland China. As part of these studies, examination of herbarium specimens of *Isoetes* collected from Songyang County in southeast China revealed specimens that had been previously identified as *I. sinensis*. Closer inspection of these specimens showed that they differed from *I. sinensis* in spore ornamentation. Further analysis of these herbarium specimens and living specimens from Songyang County indicate that these collections are distinct from *I. sinensis* in spore morphology and chromosome number. They represent a unique, previously undescribed species of *Isoetes*, which is named and described as follows:

Isoetes orientalis H. Liu & Q. F. Wang, sp. nov. TYPE: China. Zhejiang: Songyang County, ca. 0.15 km S of Anming Town, 12 Dec. 2002, *Liu H. & Wang J. Y. WH20021214* (holotype, WH). Figures 1, 2.

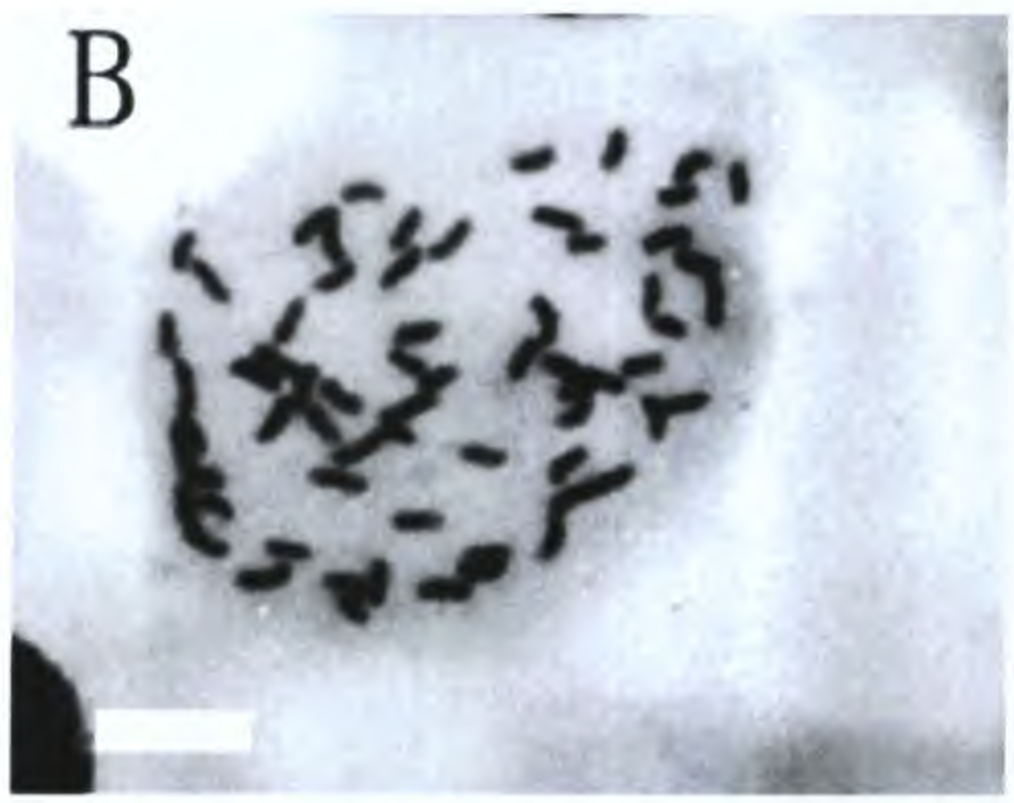
Planta aquatica ex caudice trilobo emergens. Folia 20 ad 40, viridia, usque ad 10–20 cm longa, ca. 2.0 mm lata ad medium longitudinis, basi dilatata et complanata; fibris fibrolignosis praesentibus; ligula subtriangulata, 1.5–2.0 mm longa, 2.0–3.0 mm lata. Velum rudimentarium. Sporangium basale, 5–6 mm longum; megasporae superficie reticulata ex porcis irregulariter anastomosantibus cristis laceratis coronatis constante, 350–450 μm diametro; microsporis pallide canis in massam dispositis, ellipticis, 19–29 μm longis, echinatis. Chromosomatum numerus $2n = 66$ (Fig. 1B).

Plant aquatic, emergent. Root stock 3-lobed. Leaves white basally, green above, spirally arranged, wide spreading, 10–20 cm long, ca. 2.0 mm wide at mid-length, in tufts of 20 to 40, flattened on adaxial side, rounded on abaxial side, base alate (Fig. 1A); peripheral fiber strands present; central intrastelar canal one; ligule ovate-subtriangular, 1.5–2.0 × 2.0–3.0 mm. Sporangium basal, obovate, ca. 5–6 × 3.8–4.5 mm; velum rudimentary, covering only distal edge of sporangium. Megaspores white when dry, gray when wet, ca. 350–450 μm diam. (mean = 420 μm), with reticulate texture composed of irregularly anastamosing muri with ragged crests, girdle obscure (Fig. 2A–D). Microspores gray in mass, elliptic, ca. 19–29 μm long (mean = 22 μm), tuberculate-echinate (Fig. 2F–I). Chromosomes: $2n = 66$.

Distribution. In China, Songyang County of Zhejiang Province.

Ecology. The marshes containing *Isoetes orientalis* are in a unique, swampy, loamy meadow between two mountains. The water in these marshes has a pH of 5.8. The reddish soil in which the plants are rooted has a pH of 5.4. Common associates include *Eriocaulon alpestre* Hooker f. & Thomson, *Juncus effucus* L., *Cyperus haspan* L., *Murdannia triguetra* (Wallich) Brückner, and *Oenanthe javanica* (Blume) DC.

Isoetes orientalis and *I. sinensis* both occur in Zhejiang Province, but they are separated by ele-



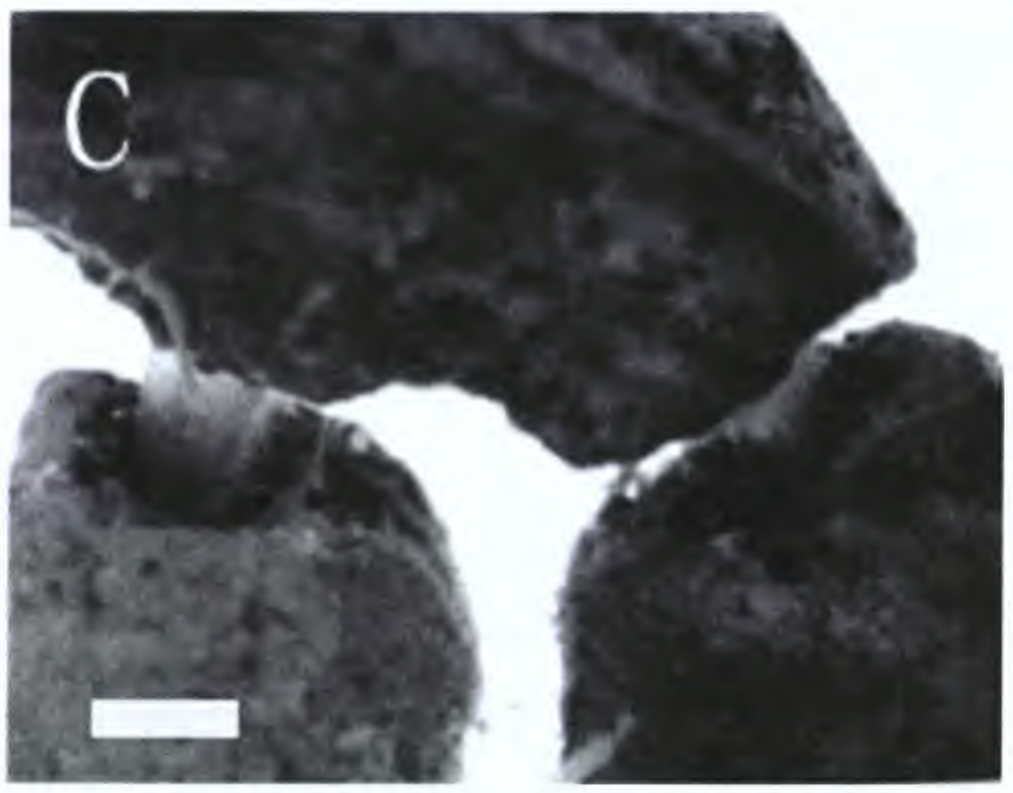


Figure 1. *Isoetes orientalis* H. Liu & Q. F. Wang. —A. Holotype: *Liu H. & Wang J. Y. WH20021214* (WH). —B. Somatic chromosomes in mitotic root tip squash. —C. Roots with reddish rhizosphere. Scale bar: A = 2 cm; B = 10 μm; C = 200 μm. Figures B and C from isotype: *Liu H. & Wang J. Y. WH20020215* (WH).

vation. The *I. orientalis* populations occur at 1200 m, whereas *I. sinensis* grows between 130 and 300 m.

Leaf features. In cross section, the leaves of *Isoetes orientalis* are oval and almost completely occupied by four, thin-walled, oblong air chambers with the two adaxial air chambers being slightly larger than the abaxial ones. In contrast, the air chambers in the leaves of *I. sinensis* appear to be smaller, more circular, and have thicker walls. Furthermore, *Isoetes orientalis* has one intrastelar canal, whereas *I. sinensis* has three or more intrastelar canals (Takamiya et al., 1997).

Root features. A noteworthy feature of *I. orientalis* is the reddish, sheathing mantle formed around its dichotomously branched roots (Fig. 1C). The reddish color of this mantle or rhizosphere is reportedly due to oxidation of iron in the soil effected by oxygen released from the roots (Tessenow & Baynes, 1975, 1978). Certain kinds of bacteria and fungi grow in the rhizosphere of *Isoetes* (Sharma, 1998). This feature has not been observed on the roots of *I. sinensis*, and it has not been previously reported for any species of *Isoetes* in Asia.

Spore size and texture. Spore measurements and photomicrographs were made using a Hitachi S-800 scanning electron microscope at 15 Kv. Megaspores of *I. orientalis* are ca. 350–450 μm diam. (mean = 420 μm diam., N = 25), whereas, according to Huang et al. (1992), megaspores of *I. sinensis* are ca. 360–390 μm diam. Microspores of *I. orientalis* are 19–29 μm long (mean = 22 μm long, N = 40), whereas, according to Huang et al. (1992), the microspores of *I. sinensis* are 19–20 μm long and average 20 μm long.

Megaspores of *I. orientalis* have an irregular cristate-reticulate ornamentation (Fig. 2A–D), whereas those of *I. sinensis* are cristate with fewer anastomosing ridges (Watanabe et al., 1996: 290, figs. 39–43). Megaspore ornamentation of *I. orientalis* resembles that of the octaploid *I. pseudojaponica* M. Takamiya, Mitsu. Watanabe & K. Ono (Watanabe et al., 1996: 288, figs. 15–18), but they differ with respect to microornamentation. At higher magnification, the fibrils on the megaspores of *I. orientalis* (Fig. 2E) are longer and larger than the fibrils on the megaspores of *I. pseudojaponica* (Watanabe et al., 1996: 288, fig. 19). Megaspore texture of *I. orientalis* is also similar to that of *I. japonica* A. Braun, but *Isoetes orientalis* differs from *I. japonica*

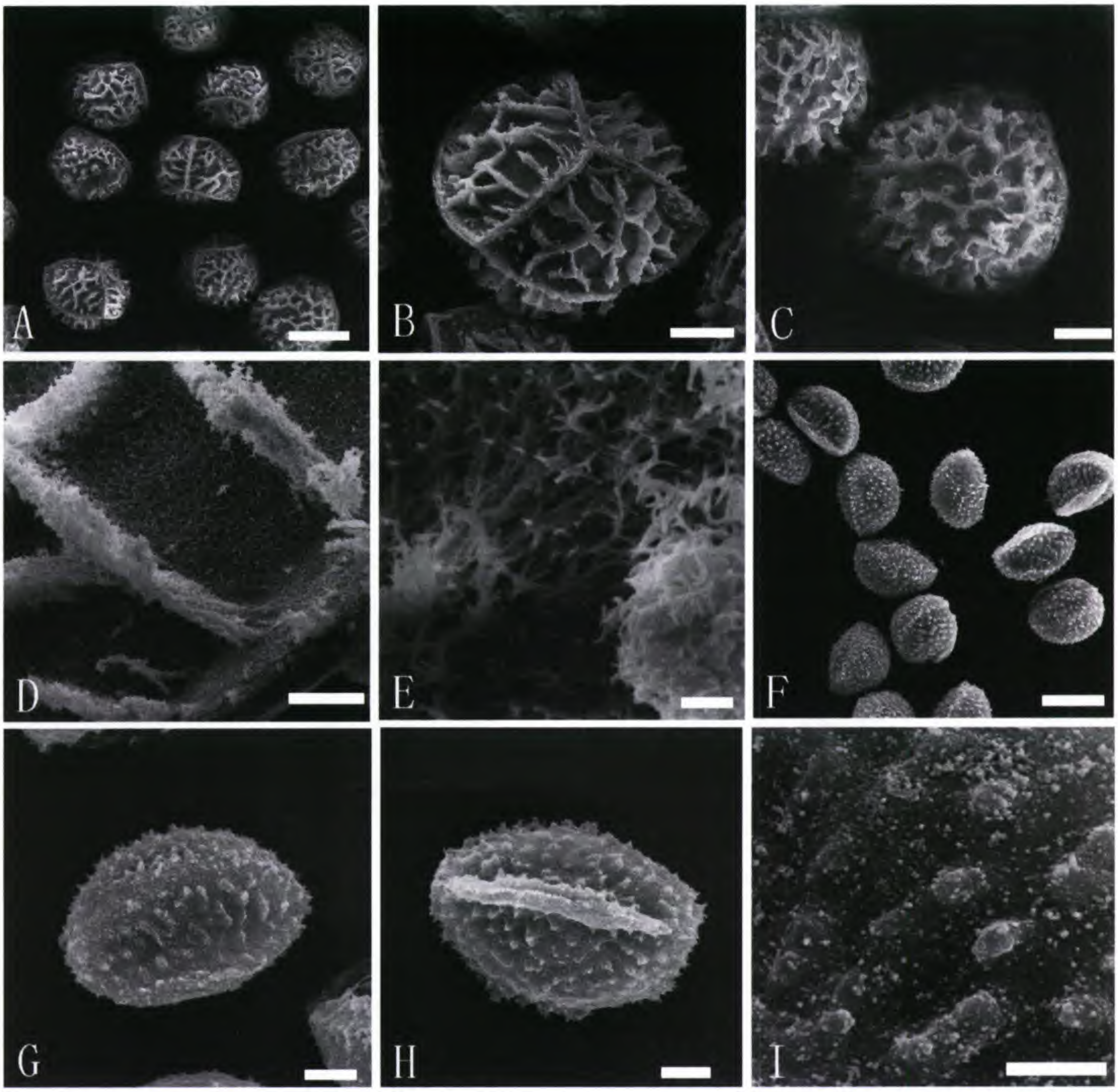


Figure 2. *Isoetes orientalis*. —A. Megaspores. —B. Proximal view of megaspore. —C. Distal view of megaspore. —D, E. Megaspore surface microornamentation. —F. Microspores. —G. Distal view of microspore. —H. Proximal view of microspore. —I. Microspore surface microornamentation. Scale bar: A = 200 μm; B & C = 75 μm; D & F = 15 μm; E & I = 2 μm; G & H = 4 μm. All from isotype: *Liu H. & Wang J. Y. WH20020215* (WH).

in microspore texture. Microspores of *I. orientalis* have an echinate-tuberculate ornamentation (Fig. 2F–H), whereas *I. japonica* microspores are nearly laevigate (Watanabe et al., 1996: 284, figs. 8–13). At higher magnification, the short spines of *I. orientalis* look more tuberculate and a granulate microornamentation is apparent (Fig. 2I). In contrast, the microspores of *I. sinensis* are clearly echinate (Huang et al., 1992: 147, fig. 3A–C; Watanabe et al., 1996: 290, figs. 46–50).

Although *Isoetes orientalis* and *I. sinensis* differ in spore ornamentation, the plants are similar in general appearance and growth habit. Both species are much alike in leaf, sporangium, ligule, and velum characters, as well. Early descriptions of *Isoetes* species were based on general appearance and habit, and this might be the reason *I. orientalis* was originally identified as *I. sinensis*.

Cytology. Chromosome counts were made from root tips of plants collected at the type locality and prepared following the methods of Liu et al. (2002). Counts from a total of 80 cells found in root tip squashes of 12 individuals showed that *I. orientalis* is a hexaploid with a chromosome number of $2n = 66$ (Fig. 1B). The base number for *Isoetes* is $x = 11$ (Löve et al., 1977).

Takamiya et al. (1994) recognized $2n = 44$, 65, 66, and 68 cytotypes for *I. sinensis*. Takamiya et al.

(1997) revised this earlier taxonomy recognizing the tetraploid cytotype as *I. sinensis* var. *sinensis* and the $2n = 65$, 66, and 68 cytotypes as *I. sinensis* var. *coreana* (Y. H. Chung & H. K. Choi) M. Takamiya, Mitsu. Wantanabe & K. Ono. According to Takamiya et al. (1997), both of these varieties have cristate megaspores and echinate microspores. Their megaspore texture is distinct from *I. orientalis*, which has reticulate megaspores and echinate-tuberculate microspores.

Phenology. Megaspores of *Isoetes orientalis* mature from mid May to early September. Microspores develop from late June to mid October. By December, most sporophylls have decayed and only a few depauperate, green leaves remain, but like other emergent or amphibious quillworts in China, *I. orientalis* stays green, at least to some extent, through the winter.

Like all other quillworts in China, *I. orientalis* is a rare and endangered species. To date, it has been found at only two sites, one of which has been decimated. The last known extant *I. orientalis* population covers no more than 200 square meters and contains fewer than 400 individuals. Pollution and increasing urbanization continue to raise the risk of extinction for this species. Protection of the one remaining population of *I. orientalis* is crucial, and searches for additional populations are urgently needed.

Paratype. CHINA. **Zhejiang:** Songyang County, Anmin Town, Andaihou, *Lou L. H. 227* (SY, ZJFC).

Acknowledgments. We are grateful to Wang Jin-Yuan and Liu Xing for assistance in conducting field studies. We are particularly indebted to Wang Yong, Chen Jing-Ming, Dong Yuan-Huo, and Wu Cui, members of the pteridophyte research group of the laboratory of Plant Systematics and Evolutionary Biology at Wuhan University, for help and suggestions in preparing this manuscript. We thank Roy Gereau for assistance with the Latin diagnosis for *Isoetes orientalis*. This study was funded by the State Key Basic Research and Development Plan of China (G2000046805).

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A New Species of *Freesia* (Iridaceae: Crocoideae) from the Succulent Karoo, South Africa, and Notes on Nomenclature and Infrageneric Classification

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ABSTRACT. *Freesia marginata* (Iridaceae: Crocoideae) is a new species from the Breede River valley near Worcester in Western Cape Province, South Africa. A local endemic of succulent karoo shrubland, it resembles *F. caryophyllacea* in its flowers and short, prostrate leaves, but it is distinguished from all other species of *Freesia* by the leathery, somewhat glaucous leaves with a prominent submarginal vein. The four species previously placed in the genus *Anomatheca* are recognized in *Freesia* as the new subgenus *Anomatheca*. Three of the species, *F. grandiflora*, *F. laxa*, and *F. verrucosa*, are segregated into section *Anomatheca*, and *F. viridis* is placed in the new section *Alatae*.

Key words: Crocoideae, *Freesia*, Iridaceae, South Africa, succulent karoo.

Freesia Klatt is a small tropical and southern African genus with a marked center of diversity in the southern part of Western Cape Province, South Africa, an area of winter rainfall and summer drought (Goldblatt, 1982; Manning et al., 2002). The genus is well defined by its conical corms covered by netted tunics, strongly inclined to horizontal spikes with the flowers borne on the upper side, style branches divided for half their length, rugose or papillate capsules, and seeds in which the raphe is more or less inflated and the surface smooth or rugose but without secondary sculpturing (Goldblatt & Manning, 1995). In its earlier circumscription, *Freesia* comprised only those species with highly fragrant flowers in which the funnel-shaped perianth is divided into a slender basal portion that widens abruptly into a longer, more or less cylindrical upper portion (Goldblatt, 1982). The genus was expanded by Goldblatt and Manning (1995) to include the four species of the genus *Anomatheca* Ker Gawler. *Freesia* currently comprises 16 species, including the recently described *Freesia fucata* J. C. Manning & Goldblatt from the Breede River valley between Worcester and Villiersdorp in Western Cape Province (Manning & Goldblatt, 2001).

The discovery of *Freesia fucata* from such a well-populated area is remarkable, but is matched by the discovery of yet another species from the same valley, here described as *Freesia marginata*. The discovery of this species provides further evidence that the drainage basin of the Breede River, which forms the region known as the Worcester Karoo, is a distinct enclave of endemism for Iridaceae. Species of Iridaceae in the southern African winter-rainfall zone display a high degree of substrate fidelity (Goldblatt & Manning, 1996), and edaphic and topographic diversity appear to have played a significant role in speciation in the flora (Goldblatt & Manning, 1998, 2000, 2002). The high number of locally endemic species of Iridaceae in the Worcester Karoo can probably be ascribed to local isolation combined with the mosaic of soil and associated vegetation types that occur in the basin (Low & Rebelo, 1996). These range from fynbos on the sandstones of the fringing mountains, through a transitional belt of renosterveld on better watered clay soils to succulent karoo on the drier soils in valley bottoms and on sunbaked north-facing hill slopes.

Freesia marginata J. C. Manning & Goldblatt, sp. nov. TYPE: South Africa. Western Cape Province: Worcester District, stony washes between Worcester and Roberston, 25 May 2002, *J. C. Manning 2734* (holotype, NBG; isotypes, MO, PRE). Figure 1.

Plantae 4–10 cm altae, cormo conico 15–20 mm diam. tunicis pallide reticulatis, foliis 4–7 plerumque prostratis lanceolatis 20–60 × 6–15 mm submarginalis prominentibus, caule raro uniramoso dense et minute puberulo, spica inclinata 4–10-florum, floribus 30–37 mm longis fra-

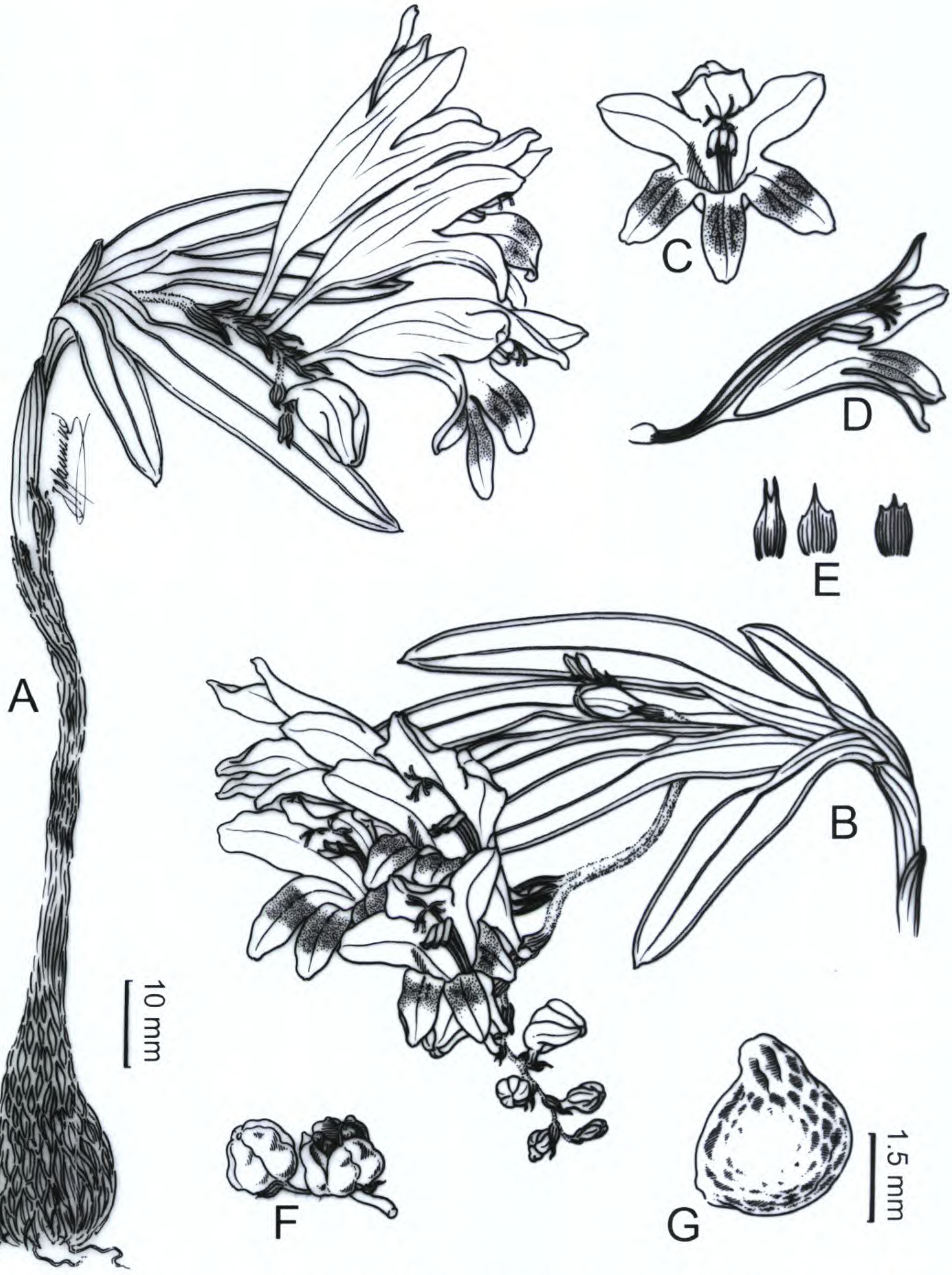

Figure 1. *Freesia marginata* J. C. Manning & Goldblatt. —A. Whole plant. —B. Flowering spike. —C. Flower in front view. —D. Half flower. —E. Inner bract (left) and two different outer bracts to show variation (center and right). —F. Capsules. —G. Seed. Drawn from *J. C. Manning 2734* (holotype, NBG).

grantibus albis plerumque externe purpureis suffusis, tepalis inferioribus aurantiacis notatis, tubo perianthii 18–25 mm longo infime filiforme 6–10 mm longo, tepalis inaequalibus, dorsale grandiore suberecto obovato 12–15 × 7–8 mm, inferioribus recurvatis, filamentis 15–17 mm longis, antheris 5–5.5 mm longis, stylo diviso prope apicem antherarum.

Plants small, 4–10 cm high, usually ± prostrate; *corm* conic, 15–20 mm diam., the tunics of pale,

medium-textured, reticulate fibers, accumulating with age and forming a long neck around the base of the stem; *cataphylls* membranous, flushed deep purple above ground level; *stem* flexed outward above the uppermost leaf sheath and then prostrate or horizontal, densely puberulous, simple or rarely with one branch. *Foliage leaves* (4)5 or 6(7), prostrate or rarely erect, oblong to lanceolate, acute, leathery, ± glaucous, with relatively inconspicuous pseudomidrib but distinct submarginal vein, 20–50(60) × 6–15 mm, slightly shorter than to half as long as the stem. *Spike* horizontal, 4- to 10-flowered; *bracts* soft, herbaceous, green with hyaline margins, the outer all tricuspidate or the upper obovate, with a prominent central cusp tipped with rusty brown, 5–7 mm long, the inner bracts slightly longer, 7–8 mm long, forked for 2–3 mm, cusps tipped rusty brown. *Flowers* (30–)33–37 mm long, strongly violet-scented, white, usually lightly flushed purple on the reverse of the tepals, the base of the lower tepals yellow-orange, usually with a dark midline; perianth tube 18–25 mm long with a basal narrow part 6–10 mm long, widening ± abruptly into a wider, flared upper portion; tepals unequal, the dorsal largest, erect, obovate, 12–15 × 7–8 mm, the upper laterals slightly narrower, oblong-lanceolate, the lower tepals recurved, the lower laterals oblong-lanceolate, 11–13 × 5.0–5.5 mm, the lower median oblong, 11–12 × 4–5 mm; *filaments* arcuate, inserted at the base of the widened upper portion of the perianth tube, included, 15–17 mm long; *anthers* 5.0–5.5 mm long; *ovary* ovoid, 3 mm long; *style* dividing below or opposite the anther apices, the branches deeply forked. *Capsules* oblong or subglobose, three-lobed, minutely papillate when fresh, (5–)6–10 × 5–10 mm; *seeds* globose with lightly to moderately inflated chalaza and raphe, rugose, glossy reddish or purplish brown, 2.0–3.0 mm diam.

Distribution. *Freesia marginata* is currently known from a single population between Worcester and Roberston in the valley of the Breede River in Western Cape Province, South Africa. An unconfirmed sighting (Snijman, pers. comm.) suggests, however, that further populations occur in the vicinity. Plants from the type population are restricted to washes at the base of a prominent sandstone knoll where they grow in decaying sandstone with the corms deeply buried in sandy loam in rock crevices. The vegetation at the site is open succulent karoo, dominated by *Ruschia caroli* (L. Bolus) Schwantes (Aizoaceae) and *Pteronia paniculata* Thunberg (Asteraceae), with scattered bushes of *Wiborgia mucronata* (L. f.) Druce (Fabaceae). Plants of *Freesia marginata* are typically low-growing, with prostrate leaves and more or less prostrate inflorescences, although individuals growing in the shade of small bushes develop suberect leaves and an inflorescence that is borne horizontally above the ground. The stem usually remains prostrate in fruit and the capsules are borne on the ground and often lightly covered by soil.

Phenology. Plants flower in the early winter, from late May to early June.

Etymology. From the Latin *marginata*, "margined," referring to the prominent submarginal vein of the foliage leaves.

The puberulous stem, green bracts, and narrowly ovate lower tepals of *Freesia marginata* are characteristic of section *Viridibractea* (Goldblatt, 1982) and indicate its placement in this section. Within the section it closely resembles *F. caryophyllacea* (Burman f.) N. E. Brown in its flowers, prostrate leaves, and early flowering, but is quite distinct from that species in the leathery texture of the leaves, their more or less glaucous coloring, inconspicuous pseudomidrib, and especially in the prominent submarginal vein. This is clearly visible in fresh and dried leaves as a translucent line running parallel to but ca. 0.5 mm in from the leaf margin. Anatomically, the leaves of *F. marginata* are characterized by ca. 20 layers of mesophyll, and vascular bundles that are not differentiated into primary and secondary bundles and in which sclerenchyma phloem caps are rarely developed. A marked exception are the submarginal bundles, which are situated very near the marginal vein, and in which the bundle sheaths are massively developed to form a complete sheath extending to the epidermis (Fig. 2B). The leaf of *Freesia caryophyllacea*, in contrast, has ca. 10 layers of mesophyll and a prominent pseudomidrib with the bundles on either side clearly differentiated into primary and secondary bundles, each primary bundle with a well-developed sclerenchyma phloem cap. The submarginal veins are some distance from the marginal vein and have normally developed phloem caps that do not extend as complete sheaths to the epidermis (Fig. 2A). The two species also differ in their ecology: *Freesia caryophyllacea* is a species of renosterbos shrubland on stony clay soils. It is relatively widespread in the Breede River valley and in the Overberg from Caledon to Swellendam. Populations of *F. caryophyllacea* in the Breede River between Worcester and Roberston appear to flower in mid to late June, thus later than *F. marginata*. *Freesia marginata*, in contrast, occurs on decaying sandstone in succulent karoo and flowers

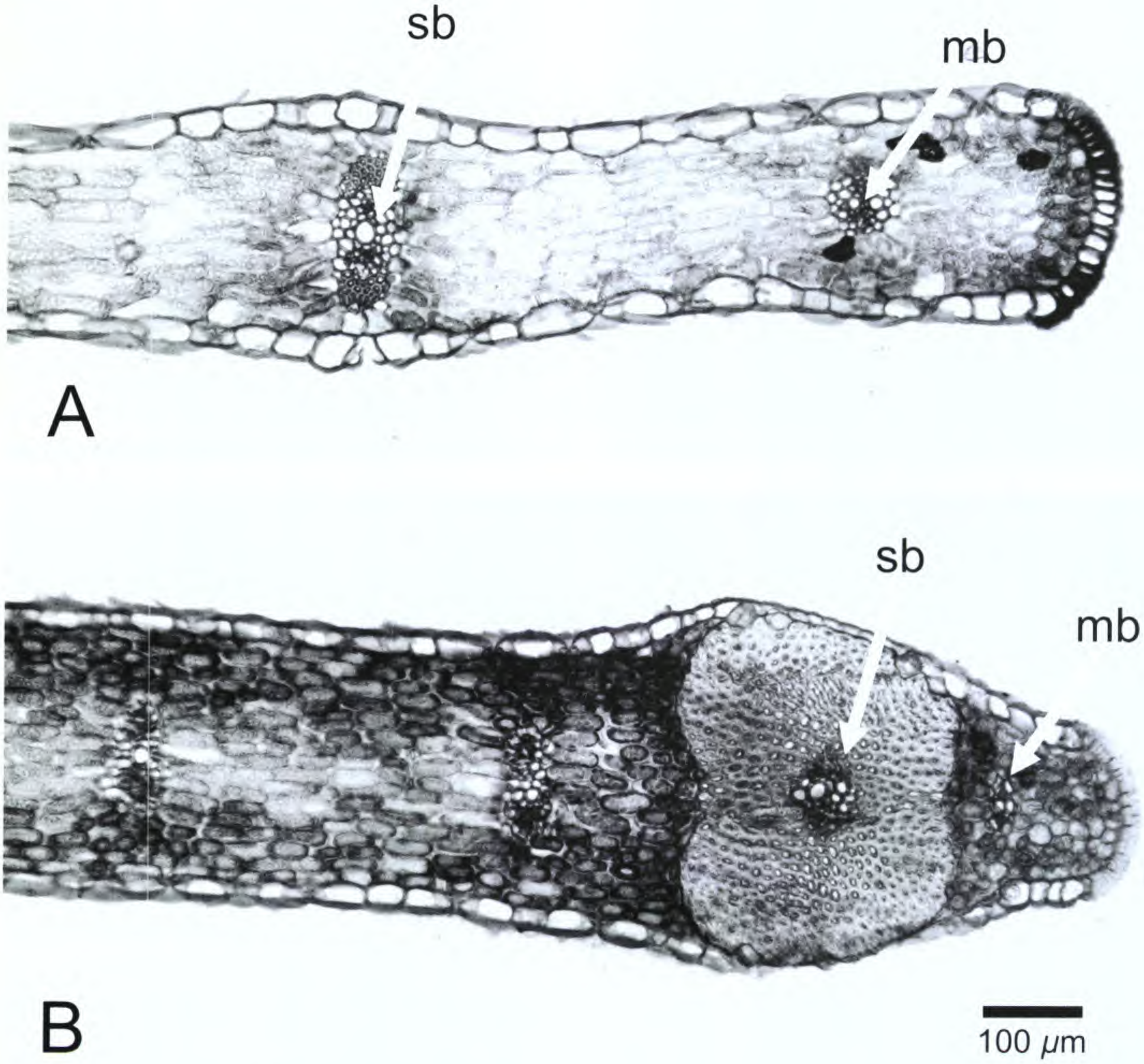

Figure 2. Comparison of the anatomy of the leaf margin of *Freesia caryophyllacea* (A) and *F. marginata* (B). sb, submarginal bundle, mb, marginal bundle. (A) from plants cultivated at Kirstenbosch Gardens, originally collected at Bredasdorp; (B) from plants from the type population near Worcester.

some weeks earlier than this, in late May or early June.

The submarginal vein in the leaves of *Freesia marginata* is unique in the genus but occurs in certain species of *Tritonia* Ker Gawler, including *T. disticha* (Klatt) Baker, *T. drakensbergensis* M. P. de Vos, and *T. lineata* (Salisbury) Ker Gawler (De Vos, 1999). The curious, tricuspidate bracts that occur in *F. marginata* are found elsewhere in the genus in *F. fucata*, another recently described local endemic species of the same valley system (Manning & Goldblatt, 2001).

Freesia marginata was first collected in 2000 by Deon Kotze, horticulturist at the Karoo Botanic Garden, who showed us living plants in the collection in June 2001. Although past flowering, the distinctive leaves made it apparent that they represented an undescribed species, and flowering material was collected the following year.

Infrageneric Classification of *Freesia*

The last revision of the genus *Freesia* (Goldblatt, 1982) recognized the two sections *Freesia* sect. *Viridibractea* Goldblatt and section *Freesia*, encompassing 11 species. With the transfer into *Freesia* of the species previously placed in the genus *Anomatheca* Ker Gawler (Goldblatt & Manning, 1995), however, it is now necessary to emend the classification of the genus to accommodate them. Until further knowledge is forthcoming concerning species' relationships in the genus, it seems best to recognize the four species previously placed in *Anomatheca* as a separate subgenus, circumscribed by

their hypocrateriform flowers with the stamens inserted near the mouth of the corolla tube, which is slender and cylindrical throughout or widened only at the mouth. *Freesia* subg. *Freesia* is recognized by the distinctly funnel-shaped flowers in which the stamens are inserted near the middle or in the lower half of the perianth tube, separating the narrow lower portion from the abruptly widened upper portion. Within *Freesia* subg. *Anomatheca*, *F. viridis* (Aiton) Goldblatt & J. C. Manning is immediately distinguished by its ridged or winged inflorescence axis and unmarked, green or brownish green flowers, and is appropriately placed in a separate section, *Freesia* sect. *Alatae*. The remaining three species of *Freesia* sect. *Anomatheca* (*Freesia grandiflora* (Baker) Klatt, *F. verrucosa* (Vogel) Goldblatt & J. C. Manning, and *F. laxa* (Thunberg) Goldblatt & J. C. Manning) have pink or red (rarely white to bluish) flowers marked with darker nectar guides on the lower tepals, and terete flowering stems.

We therefore suggest the following infrageneric classification for *Freesia*:

Freesia Klatt, Linnaea 34: 672. 1866. TYPE: *Freesia refracta* (Jacquin) Klatt.

I. **Freesia** subg. **Anomatheca** (Ker Gawler) J. C. Manning & Goldblatt, stat. nov. Basionym: *Anomatheca* Ker Gawler, Koenig & Sims Ann. Bot. 1: 227. 1804. *Anomaza* Lawson ex Salisbury, Trans. Hort. Soc. London 1: 323. 1812. *Lapeirousia* subg. *Anomatheca* (Ker Gawler) Baker, Handb. Irid.: 173. 1892. TYPE: *Anomatheca verrucosa* (Vogel) Goldblatt (*Ixia verrucosa* Vogel).

Freesia [subg. *Anomatheca*] sect. **Anomatheca** (Ker Gawler) J. C. Manning & Goldblatt, comb. et stat. nov. Type as for subgenus.

1. *Freesia grandiflora* (Baker) Klatt
2. *Freesia verrucosa* (Vogel) Goldblatt & J. C. Manning
3. *Freesia laxa* (Thunberg) Goldblatt & J. C. Manning

Freesia [subg. *Anomatheca*] sect. **Alatae** J. C. Manning & Goldblatt, sect. nov. TYPE: *Freesia viridis* (Aiton) Goldblatt & J. C. Manning.

Plantae foliis erectis planis vel crispis, caule complanato striato vel alato, bracteis viridis, floribus hypocrateriformibus tubo cylindrico ad apicem curvato, viridis vel brunneis.

Foliage leaves plane or crisped; stem longitudinally ridged or winged; bracts green; flowers hypocrateriform with tubular perianth tube sharply curved at the apex, greenish or brownish.

4. *Freesia viridis* (Aiton) Goldblatt & J. C. Manning

II. **Freesia** subg. **Freesia.** TYPE: *Freesia refracta* (Jacquin) Klatt.

Freesia [subg. *Freesia*] sect. **Viridibractea** Goldblatt, J. S. African Bot. 48: 56. 1982. TYPE: *Freesia alba* (G. L. Meyer) Gumbleton.

5. *Freesia alba* (G. L. Meyer) Gumbleton
6. *Freesia caryophyllacea* (Burman f.) N. E. Brown
7. *Freesia fergusoniae* L. Bolus
8. *Freesia fucata* J. C. Manning & Goldblatt
9. *Freesia leichtlinii* Klatt
10. *Freesia marginata* J. C. Manning & Goldblatt
11. *Freesia sparmannii* (Thunberg) N. E. Brown

Freesia [subg. *Freesia*] sect. **Freesia**

12. *Freesia andersoniae* L. Bolus
13. *Freesia corymbosa* (Burman f.) N. E. Brown
14. *Freesia occidentalis* L. Bolus
15. *Freesia refracta* (Jacquin) Klatt
16. *Freesia speciosa* L. Bolus

Acknowledgments. We thank the Lourens family for permission to collect on their farm, Cornelia Klak for help with the identification of the Aizoaceae, and Roy Gereau for his infallible assistance in matters of nomenclature. Material was collected with a permit from Western Cape Nature Conservation.

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Aechmea sucreana, a New Species of Bromeliaceae from Espírito Santo State, Brazil

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ABSTRACT. A new species of Bromeliaceae, *Aechmea sucreana*, found in Espírito Santo State, Brazil, is described and illustrated. It is distinguished from its closest relative, *A. blanchetiana*, on the basis of inflorescence features.

Key words: *Aechmea*, Brazil, Bromeliaceae.

During development of the Biology and Conservation of Bromeliaceae of the Atlantic Rainforest Project, a scientific program of the Rio de Janeiro Botanic Garden Research Institute, 11 scientific expeditions were made between 1998 and 1999. The project encompassed the largest remaining area of rain forest, and major fragments. A total of 92,394 km of roads and trails were accessed in 78 conservation units and 59 private areas through 14 Brazilian states. Seven hundred twenty-nine taxa were obtained and observed, some of them considered new taxa to this family, representing ca. 69% of the total Bromeliaceae recounted in the literature for the Atlantic Rainforest biome (Martinelli, unpublished data). Information on the biology and the status of conservation of the Bromeliaceae species and their respective populations were obtained and stored in a database. In addition to voucher specimens deposited in RB, one live collection was secured for taxa considered endemic and/or threatened with extinction and placed into cultivation. A total of 1842 specimens were collected and are being cultivated in a specially built greenhouse in the Rio de Janeiro Botanic Garden Research Institute. The living collections are part of an ex-situ conservation program, including the maintenance of a germplasm bank and the propagation and later reintroduction, when necessary, of the species into their original habitats.

This paper presents a new species of *Aechmea* collected by the project during the expedition in Espírito Santo State, Brazil.

Aechmea sucreana Martinelli & C. Vieira, sp. nov. TYPE: Brazil. Espírito Santo: Linhares, Imbiriba, Fazenda São Jorge, próximo da Reserva Florestal de Linhares, Mata Atlântica, Restinga aberta, 10 m s.m., 19°11′27″S, 39°52′83″W, 5 Aug. 1999 (fl), *G. Martinelli 15559 & L. Heron, R. Azoury* (holotype, RB 353539). Figure 1.

Species nova *Aechmeae blanchetianae* affinis sed inflorescentia breviore, rachidibus internodiis minoribus, floribus plus dense dispositis, ac foliis minoribus differt.

Plant flowering to 1.2 m high. Leaves ca. 25, erect or suberect, forming a broadly funnelform rosette; sheaths elliptic, 22–30 × (9.5)14–16 cm, spinose-serrate toward apex, pale brown, densely lepidote on both surfaces; blades yellowish green with reddish nuances on both surfaces, otherwise totally red, ensiform to narrowly triangular, 34–53 × (4)6–11 cm, lepidote on both surfaces, mainly on abaxial surface, spinose-serrate, spines dark brown, 1–2 mm long, apex acute, ending in a rigid, pungent spine. Inflorescence erect; scape reddish green at base, red toward apex, often exceeding the leaves, 41–57 × 0.5–0.7 cm, sparsely white lanate; scape bracts reddish pink, erect, strongly imbricate, enfolding the scape, oblong, entire, with acuminate apex, 9–17 × 3–4.5 cm, chartaceous, lepidote on both surfaces; fertile part of inflorescence 2- to 3-branched, many-flowered, with central rachis red, (25)36–48 cm long, sparsely white-lanate to glabrescent; primary bracts reddish pink, shorter than the branch but greatly exceeding the basal sterile portion, entire with acuminate apex, 8–15 × 1.5–3.5 cm, shorter toward inflorescence apex, chartaceous, lepidote on both surfaces; primary branches red-pink, 9 to 13, spreading-ascending, the lowest (9)12–22 cm long; secondary bracts similar to primary bracts, 3.5–5 × 0.9–2 cm; spikelets 3- to 10-flowered, 4–12 cm long, with internodes 0.8–1.3(1.5) cm; floral bracts red-pink, slightly shorter than to little exceeding the sepals (but often exceeding floral buds), 2–3.5 times as long as the

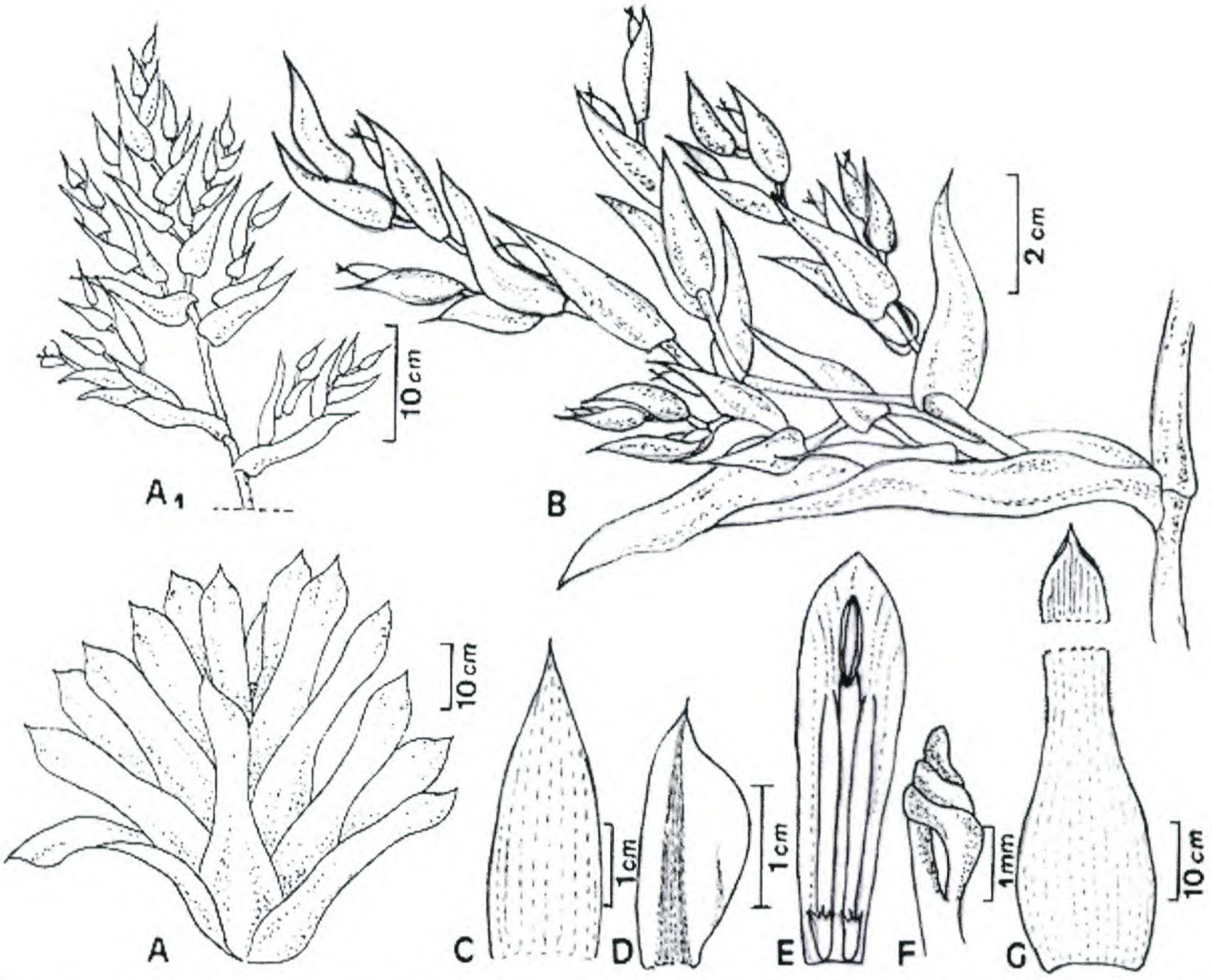

Figure 1. *Aechmea sucreana* Martinelli & C. Vieira (*G. Martinelli 15559 et al.*) —A. Habit. —A_1. Fertile part of inflorescence. —B. Segment of the inflorescence with primary branch. —C. Floral bract. —D. Sepal. —E. Petal (showing longitudinal callosities and petal appendages) and antepetalous stamen. —F. Stigma. —G. Leaf.

internodes, not covering the rachis, ovate, convex, multi-nerved, (1.8)2.4–3.8 × 1–1.1 cm, entire, with acuminate apex, sparsely lepidote on abaxial surface. Flowers polystichous, laxly to densely arranged, sessile, ca. 4 cm long; floral buds green-yellow; sepals green with apex rose and mucro red, connate at base for ca. 3 mm, ovate or narrowly ovate, strongly asymmetric, 1.6–2.1 × 1 cm, mucronate, mucro 1–2 mm long, sparsely white-lanate to glabrescent on abaxial surface; petals pale yellow, becoming pale brown after anthesis, free, linear-spatulate, apex suberect at anthesis, acute, 3.2–3.4 × 0.6 cm, bearing two longitudinal callosities parallel to staminal filaments, ca. 2.2 cm long; petal appendages 2 per petal, basal, spatulate-undulate with apex unevenly toothed, ca. 3 × 2–3 mm; stamens shorter than petals, included at anthesis, ca. 2.8 cm long; filaments 2.4–2.5 cm long, the antepetalous ones adnate to the petals for ca. 1.8 cm; anthers linear-oblong, dorsifixed at the middle, 8–9 × 4 mm, apex acute; ovary subtrigonous, 8–10 × 4–5 mm, pale green, sparsely white-lanate, placentae fixed in the upper half of the ovary, ovules numerous, caudate; epigynous tube ca. 4 mm long; style ca. 3.2 cm long; stigma conduplicate-spiral, ovoid. Fruit ellipsoid, 10–12 × 7–8 mm, red.

This species was found growing in open thicket vegetation (restinga), as terrestrial in white sand, forming dense groups. Although the occurrence of *Aechmea blanchetiana* (Baker) L. B. Smith in restinga of Linhares was registered by herbarium collections (RB), no overlap was noticed between these two species. The local vegetation where *A. sucreana* was found is endangered due to cattle activities developed in the area.

Aechmea sucreana is similar to *A. blanchetiana* in overall appearance, but can be easily distinguished by its shorter inflorescence, spikelets with shorter internodes, flowers more densely arranged, and shorter leaves.

The specific epithet is a tribute to the Brazilian botanist Dimitri Sucre, who made extensive plant collections throughout the Brazilian state of Espírito Santo.

Paratypes. BRAZIL. **Espírito Santo:** Linhares, Imbiriba, Fazenda São Jorge, próximo da Reserva Florestal de Linhares, Mata Atlântica, Restinga aberta, 10 m s.m., 19°11′27″S, 39°52′83″W, 5 Aug. 1999 (fl), *G. Martinelli 15559-A & L. Heron, R. Azoury* (MO), *G. Martinelli 15559-B & L. Heron, R. Azoury* (CEPEC), *G. Martinelli 15559-C & L. Heron, R. Azoury* (R), *G. Martinelli 15559-D & L. Heron, R. Azoury* (K), *G. Martinelli 15559-E & L. Heron, R. Azoury* (SPF) (Inst. Bot.), *G. Martinelli 15559-F & L. Heron, R. Azoury* (CVRD).

Acknowledgments. The authors thank Patricia Villela for the illustration of the new species.

A New Species of *Burmeistera* (Campanulaceae: Lobelioideae) from Ecuador

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ABSTRACT. *Burmeistera auriculata* is described from a cloud forest remnant in Pichincha, Ecuador. Although allied to *B. borjensis*, this new species is distinguished from all known congeners by its auriculate calyx.

RESUMEN. Se describe *Burmeistera auriculata* de un remanente de bosque nublado en Pichincha, Ecuador. Aunque aliado a *B. borjensis*, esta especie nueva se distingue de las demás *Burmeisteras* conocidas por su cáliz auriculado.

Key words: *Burmeistera*, Campanulaceae, Ecuador, Lobelioideae, South America.

Burmeistera Triana (Campanulaceae: Lobelioideae) comprises 102 species of robust plants (herbaceous or suffruticose perennials, shrubs, and lianas) distributed from Guatemala to Peru (Lammers, 1998, 2002). The genus is distinguished by a combination of moderate-size flowers (corollas averaging 25–35 mm long) usually borne singly in the axils of the upper leaves on ebracteolate pedicels; green or yellow corolla often suffused with maroon or purple; corolla tube neither fenestrate nor cleft dorsally; dorsal corolla lobes larger than the ventral lobes and falcate or reflexed; anther tube wide open at the orifice; baccate, often inflated fruit; and oblong to fusiform seeds much longer than broad. With this circumscription, the genus is most likely monophyletic (Luteyn, 1986; Stein, 1987a, 1987b, 1987c), a hypothesis supported by preliminary molecular data (Pepper et al., 1997; E. Knox, pers. comm.).

The last comprehensive account of *Burmeistera* was the monograph by Wimmer (1943), who recognized 77 species. More recent treatments are available for the species of Costa Rica (Wilbur, 1975), Ecuador (Jeppesen, 1981), Guatemala (Nash, 1976), Honduras (Lammers & Maas, 1998), Panama (Wilbur, 1977, 1981), and Peru (Stein, 1987c). Here and in other publications (McVaugh, 1943, 1949a, 1949b, 1957, 1965; Wimmer, 1955, 1968; Gómez & Gómez-Laurito, 1986; Lozano & Galeano, 1986; Luteyn, 1986; Stein, 1987b; Lammers, 1998, 2002), 44 new species were described, while some taxa recognized by Wimmer (1943) were reduced to synonymy.

Wimmer (1932, 1943, 1968) divided the genus into two sections: *Burmeistera* (Imberbes, nom. invalid), with all five anthers sparsely soft-pubescent or glabrous at apex; and *Barbatae* E. Wimmer, with the two ventral anthers barbate at apex. Though Wimmer further divided section *Burmeistera* into two subsections, Stein (1987b) transferred all members of subsection *Aequilatae* E. Wimmer to the genus *Siphocampylus* Pohl. This sectional classification is unsatisfactory, if only for the lack of structure afforded so large a genus. It also is not supported by preliminary molecular data (E. Knox, pers. comm.).

The senior author is currently studying the pollination biology of the genus (Muchhala & Jarrin-V., 2002). This research has revealed that, while the closely related genera *Centropogon* C. Presl and *Siphocampylus* are primarily hummingbird-pollinated, *Burmeistera* has shifted to bat pollination (Muchhala 2003, unpublished data). Although hummingbirds visit *Burmeistera* flowers in the early morning and at dusk (Feinsinger et al., 1987; Muchhala, 2003), they rarely transport pollen and only in small quantities. Meanwhile, a single visit by a bat will deposit thousands of grains on a receptive stigma.

In the course of this research, a new species was discovered in the Otonga reserve in northern Ecuador. This species, here described and named, demonstrates a number of the floral adaptations to bat pollination that are common to the genus, including nocturnal anthesis, dull coloration, rela-

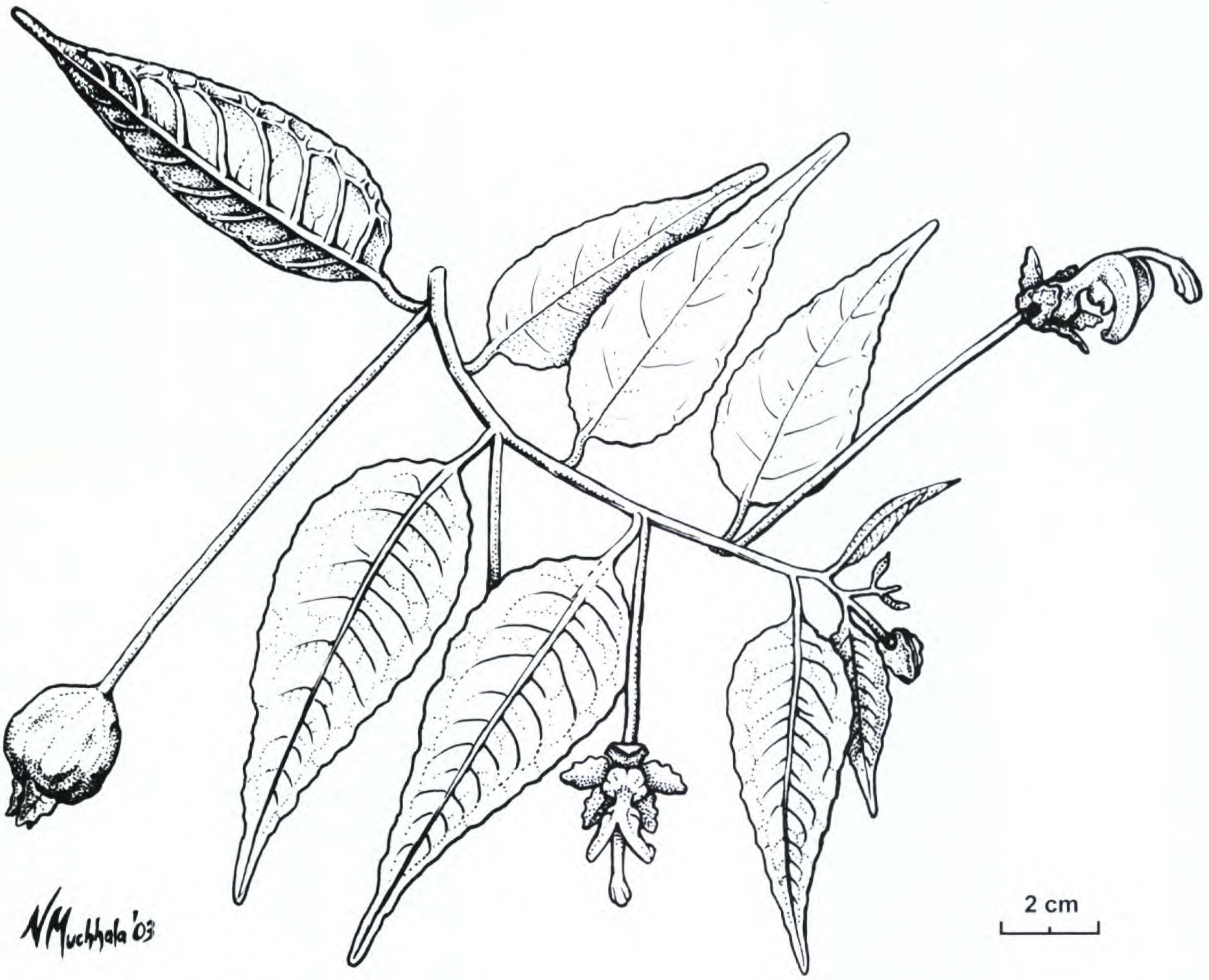

Figure 1. *Burmeistera auriculata* Muchhala & Lammers. Drawn from the holotype, *Muchhala 120*, and photos of live material.

tively wide corollas, a distinctive odor, and well-exposed flowers.

Burmeistera auriculata Muchhala & Lammers, sp. nov. TYPE: Ecuador. Pichincha: Bosque Integral Otonga, 00°25.264′S, 79°00.779′W, cloud forest, 2233 m, 7 July 2002, *N. Muchhala 120* (holotype, QCA; isotype, MO). Figure 1.

Ab omnibus caeteris speciebus *Burmeisterae* calycis lobis auriculatis differt; species sect. *Burmeisterae* affinis *B. borjensi*, sed ab hac specie lamina lanceolata parviore 7.5–14 cm longa 2.8–4.4 cm lata, pedicellis pubescentibus, hypanthio breviore 5.5–6 mm longo, calycis lobis brevioribus 9–11 mm longis, antheris dorsalibus longioribus 9.5–10.5 mm longis, et baccis globosis brevioribus 18–20 mm longis facile distinguenda.

Scandent hemi-epiphytic subshrub, 3 m tall; stems 2.0–3.3 mm diam., glabrous, occasionally branching; latex white. Leaves strictly distichous, patent; lamina lanceolate, 7.5–14 × 2.5–4.4 cm; adaxial surface minutely scabrous, dull green; abaxial surface minutely and more densely pubescent, dull light green; margin subentire; apex acuminate to almost caudate; base rounded, occasionally asymmetric; petiole 1.4–2.0 cm long, 1.0–1.5 mm diam., minutely pubescent, 1/12–1/6 as long as the lamina. Flowers solitary in upper leaf axils; pedicels 70–100 mm long, straight and ascending at anthesis, 100–150 mm long, curved and declined in fruit, 1–1.8 mm diam., minutely pubescent. Hypanthium broadly obconic, 5.5–6 mm long, 5–6.5 mm diam., minutely pubescent; calyx lobes broadly triangular, 9–11 × 7–9 mm, with reflexed auricles 4–7 mm long in the sinuses, ascending, overlapping at base, finely reticulate, minutely scabrous; margin sinuate; apex obtuse, almost emarginated; corolla light green, 18–20 mm long, sparsely and minutely pubescent or almost glabrous; tube slightly decurved, 8–9 mm long, distended at base to 8.5–9.5 mm diam., dorsiventrally compressed at middle, 3.0–3.5 mm tall, 4.0–4.5 mm wide, abruptly expanding to 7.5–8.0 mm at mouth; dorsal lobes lanceolate, strongly falcate, 23–25 × 5 mm, acuminate

at apex; ventral lobes narrowly triangular, falcate, 11–12 × 4 mm, acuminate at apex; staminal column long-exserted; filament tube 26–28 mm long, ca. 1.8 mm diam., sparsely puberulent; anther tube curved-cylindrical, long-exserted, 5 mm diam., glabrous; dorsal anthers 9.5–10.5 mm long; ventral anthers 5.5–6.5 mm long; pollen grains tricolpate, prolate, 72 μm diam. (equatorial) × 63 μm diam. (polar), the surface reticulate. Berries inflated, globose, light green, 18–20 mm long, 17–24 mm diam., crowned by the persistent calyx lobes; seeds ellipsoid, 0.9 mm long, 0.3 mm diam.

Additional illustration. Muchhala and Jarrín-V. (2002), fig. 2A.

Distribution and ecology. Burmeistera auriculata is endemic to the Andes of northwestern Ecuador and known only from the type locality, where it grows in cloud forest at elevations of 1990 to 2250 m. It flowers throughout the year, with individual flowers opening nocturnally between 1715 and 1800 hr. and senescing after 5 to 6 days. It is pollinated by glossophagine bats of the genus *Anoura* (Muchhala & Jarrín-V., 2002, as "*Burmeistera* sp.").

Etymology. The name derives from the Latin adjective *auriculatus*, "with little ears," given in reference to the unique calyx appendages.

Relationships. The most distinctive feature of this species is the large reflexed auricle associated with each sinus of the calyx. These appear to represent basal lobules of adjacent calyx lobes that have become connate. Though otherwise unknown in *Burmeistera*, similar auricles are found elsewhere in the Campanulaceae, characterizing some species of North American *Lobelia* L. sect. *Lobelia* (e.g., *L. siphilitica* L., *L. appendiculata* A. DC., *L. brevifolia* Nuttall ex A. DC.; McVaugh, 1943), as well as certain Eurasian genera of Campanuloideae (e.g., *Favratia* Feer, *Cryptocodon* Fedorov, *Michauxia* L'Héritier).

In Jeppesen's (1981) treatment of Ecuadorian *Burmeistera*, the new species keys readily to *B. borjensis* Jeppesen, known from Napo and adjacent Colombia. The two species shared the following characters: (1) glabrous scandent stems; (2) abaxially pubescent lamina with subentire margins; (3) the length of petioles and pedicels; (4) broad overlapping reticulately veined calyx lobes with sinuate margins; (5) the overall length and color of the corolla; and (6) the inflated berries. *Burmeistera borjensis*, however, differs in its larger (15–20 vs. 7.5–14 cm long, 5–8 vs. 2.8–4.4 cm wide) elliptic (vs. lanceolate) lamina, cuneate (vs. rounded) at base; glabrous (vs. pubescent) pedicels; longer hypanthium (6–8 vs. 5.5–6 mm) and calyx lobes (14–16 vs. 9–11 mm); longer corolla tube (15–18 vs. 8–9 mm); shorter dorsal corolla lobes (ca. 16 vs. 23–25 mm); shorter anthers (dorsal pair 8–9 vs. 9.5–10.5 mm); larger (30–35 vs. 18–20 mm long) ovoid (vs. globose) berry; and of course the exauriculate calyx.

In their combination of large inflated berries, curved-cylindrical anther tube, and overall floral morphology, *Burmeistera auriculata* and *B. borjensis* would appear to belong to a group of species comprising *B. refracta* E. Wimmer, *B. ignimontis* E. Wimmer, *B. cuyujensis* Jeppesen, *B. truncata* Zahlbruckner, *B. glabrata* (Kunth) Bentham & Hooker f. ex B. D. Jackson, and *B. oyacachensis* Jeppesen. Among these, only *B. cuyujensis* and *B. ignimontis* share the abaxially pubescent lamina of *B. auriculata* and *B. borjensis*, an unusual trait in the genus. Both differ from the new species in their elliptic or obovate (vs. lanceolate) lamina cuneate (vs. rounded) at base, glabrous pedicels, longer hypanthium (8–12 vs. 5.5–6 mm) with narrowly triangular or lanceolate (vs. broadly triangular) calyx lobes, longer corolla (24–35 vs. 18–20 mm) with longer tube (14–22 vs. 8–9 mm) and shorter dorsal lobes (18–22 vs. 23–25 mm).

Paratypes. ECUADOR. **Cotopaxi:** Bosque Integral Otonga, entre Quito y Sto. Domingo, cerca de San Francisco de las Pampas, *C. Nowicki & J. Mutke 1213* (QCA); Bosque Integral Otonga, *N. Muchhala 24* (QCA).

Acknowledgments. The senior author thanks Hugo Navarrete and the Pontificia Universidad Católica de Ecuador for logistical help and access to the QCA herbarium, and Giovanni Onore for access to the study site (Bosque Integral Otonga). He also thanks Paulina Moreno for help in identifying collections; it was she who first suggested that this specimen from Otonga might represent an undescribed species.

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Dos Nuevas Especies de *Gomphrena* (Amaranthaceae; Gomphrenoideae) de los Valles Secos de Bolivia

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RESUMEN. Se describe la morfología, palinología y la distribución geográfica actualmente conocida de dos especies nuevas de *Gomphrena*, ambas endémicas de los valles secos de Bolivia. *Gomphrena fuscipellita* es una especie perenne que se diferencia de otras especies de *Gomphrena* por tener tallos decumbentes y divididos dicotómicamente, por estar densamente cubiertos por pelos fusco-amarillos y por presentar inflorescencias compuestas de 5–6 capítulos y hojas involucrales grandes. *Gomphrena mizqueensis* tiene hábito anual y es morfológicamente afín a *G. pallida*, *G. phaeotricha* y *G. ferruginea*. Esta nueva especie difiere de las tres últimas por presentar tallos erectos y ramificados, tépalos con margen dentado en el ápice, brácteas cimbiformes y dentadas en el ápice, y hojas con un par de nervios laterales evidentes.

ABSTRACT. Morphology, pollen characters, and geographical distribution as currently known are described for two new species of *Gomphrena*, both endemic to dry valleys of Bolivia. *Gomphrena fuscipellita* is a perennial, differing from all other species of *Gomphrena* by its decumbent habit, generally dichotomously branching stems, dense yellowish brown indumentum, and compound inflorescences with large involucral bracts. *Gomphrena mizqueensis* is an annual, morphologically allied to *G. pallida*, *G. phaeotricha*, and *G. ferruginea*. From the three it differs by its erect habit branching in its upper parts, tepals with dentate apex, cymbiform, apically dentate bracts, and ovate leaves with one conspicuous pair of lateral veins.

Key words: Amaranthaceae, Bolivia, dry valleys, endemics, *Gomphrena*, pollen.

Gomphrena L. es uno de los géneros con mayor número de especies en la familia de Amaranthaceae (Eliasson, 1988; Siqueira, 1992; Townsend, 1993), e inclusive posee más especies que *Alternanthera*. La mayor diversidad del género se presenta en el Nuevo Mundo (80–100 spp.), en particular en el Neotrópico (principalmente en Bolivia, Brasil) y en Australia (33 spp.; Palmer, 1998). Las especies de *Gomphrena* son subarbustos, hierbas perennes o hierbas anuales. El género se caracteriza por hojas opuestas, flores solitarias y agrupadas en capítulos subglobosos o cortamente cilíndricos, filamentos casi completamente connados formando un tubo profundamente emarginado o 2-lobado, anteras sésiles o subsésiles y alternando con los lobos que son tan largos como las anteras o ligeramente mas cortos, y estigma formando dos ramas cilíndricos o filiformes. Los únicos tratamientos taxonómicos sobre especies neotropicales fueron realizados por Holzhammer (1955, 1956), y por Siqueira (1992), quien estudió solamente taxa brasileros. Otras importantes contribuciones para el género *Gomphrena* en América del Sur fueron realizados por Pedersen (1976, 1990, 1997, 2000), quien discute la taxonomía y nomenclatura de algunas especies.

Gomphrena forma parte de la subfamilia Gomphrenoideae que se caracteriza por tener anteras biloculares (Schinz, 1893, 1934). Resultados obtenidos a través de investigaciones palinológicas (Borsch, 1998) y de la filogenia obtenida sobre la base de secuencias de ADN (*rbc*L, Kadereit et al., 2003; *mat*K/*trn*K, Müller & Borsch, 2005; *ndh*F, Pratt, 2003; *trn*L-F, Sánchez del-Pino et al., inéd.) sugieren que la subfamilia Gomphrenoideae es monofilética. Sin embargo, estos estudios también sugieren que *Gomphrena* s.l. no es monofilética ya que un grupo de especies cercanas a *Gomphrena*

elegans Martius forma una línea distinta. Las especies aquí examinadas pertenecen al género *Gomphrena* sensu stricto, el que sí es monofilético de acuerdo a resultados preliminares de un análisis filogenético del género *Gomphrena* (Ortuño & Borsch, inéd.).

Durante la ejecución de los proyectos actualmente vigentes sobre la diversidad de la familia Amaranthaceae en Bolivia y sobre las relaciones filogenéticas del género *Gomphrena*, se reconocen dos nuevas especies singulares y fácilmente distinguibles. En este trabajo describimos las dos especies y presentamos datos sobre su distribución, ecología y una evaluación preliminar sobre sus estados de amenaza.

Gomphrena fuscipellita Ortuño & Borsch, sp. nov. TIPO: Bolivia. Cochabamba: Mizque, Tintin, camino de Mizque a Raykampampa, ladera exposición este, con pendiente de 35°, estacionalmente húmeda, 18°09′95″S, 65°25′98″W, 2870 m, 3 abr. 2003, *T. Borsch & T. Ortuño 3594* (holotipo, LPB; isotipos, BOLV, BONN, K, MO). Figuras 1, 3A, 3C, 4A, 4C.

Herba manifeste perennis radice crassa; caulibus 1 vel 2 (vel 3), decumbentibus, dichotome ramosis, usque ad 25 cm longis, trichomatibus fuscis dense pilosis. Lamina foliaris ovata, 1.7–2.3 cm longa, 1.3–1.8 cm lata, dense pilosa. Inflorescentia composita ex spicis (5 vel) 6 subglobosis congestis foliis involucratibus 5 (sicut foliis inferioribus dense pilosis) quam spicis longioribus subtentis constans; bractea ovata, membranacea, glabra, 2.0–2.2 mm longa, brevissime mucronata; bracteolis lanceolatis, membranaceis, flore aequilongis vel breve longioribus, 3.1–5.0 mm longis, dorsaliter crista munitis. Flos tepalis dissimilibus, margine piloso, scariosis, externis lanceolatis 3.2–5.0 mm longis, 0.8–1.3 mm latis, intermedio simili, trinervi, sicut externis trichomatibus undulatis e base ortis, internis linearibus, 3.0–4.9 mm longis, 0.2–0.8 mm latis; filamentorum tubi lobulis acutis liberis ca. 0.4 mm longis; antheris 1.0–1.4 mm longis; stigmate in ramos filiformes desinente.

Hierba perenne, tallos 1–2(–3), decumbentes, ramificados dicotómicamente, 20–25 cm de largo, densamente hirsutos, tricomas fuscos, 0.6–1.2 mm de largo, uniseriados, con 4–6 células, la célula basal más amplia, las paredes celulares con gránulos. Hojas opuestas, pecíolo corto e inconspicuo, láminas ovadas o elípticas, 1.7–2.3 × 1.3–1.8 cm, ápice agudo o ligeramente acuminado, base cortamente decurrente, superficie densamente hirsuta, pelos ± adpresos y similares a los del tallo. Inflorescencias ascendentes, con pedúnculos de 2–7 cm de largo, capítulos solitarios de 1.2–2.2 cm de diámetro, terminales o axilares, compuestos de 6 espigas subglobosas, protegidas por 5 hojas involucrales. Hojas involucrales de color verde claro en la superficie adaxial y de color verde pálido en la superficie abaxial, ovadas, sésiles, 0.5–1.1 × 0.3–1.0 cm, muy densamente hirsutas; brácteas ovadas, cimbiformes, membranosas, hialinas y glabras, llegando ± a la mitad de la altura de la flor, 2.0–2.2 mm de largo × 0.9–1.0 mm de ancho, con 1 nervadura cortamente excurrente (< 0.2 mm); bractéolas lanceoladas, cimbiformes, membranosas, glabras, blancas, casi del tamaño o un poco más largas que la flor, 3.1–5.0 × 0.9–1.1 mm, en la parte dorsal presentan una cresta, prolongada hasta cerca la base, ligeramente encorvada, distalmente dentada. Tépalos desiguales, 5, los dos externos lanceolados, 3.2–5.0 × 0.8–1.3 mm, 3-nervados, escariosos y algo coriáceos desde la base hasta más o menos la mitad, el margen algo dentado con pocos tricomas blancos y simples, dispuestos en un ángulo de 90°; el tépalo intermedio similar a los externos, 3.1–5.0 × 0.6–1.0 mm, los dos internos lineales, 3.0–4.9 × 0.2–0.8 mm, 1-nervados, escariosos, con margen glabro; tricomas blancos ondulados de hasta de 4 mm saliendo de la base de los tépalos externos e intermedio; filamentos 3.1–5.0 mm de largo, completamente unidos formando un tubo, lóbulos libres, 0.4 mm de largo, anteras de 1.0–1.4 mm de largo; gineceo subgloboso, 0.5 mm; estilo 0.4–0.5 mm; estigma de 0.8 a 1.3 mm de largo con ramas filiformes.

Polen esferoidal, de 14.4–16.0 μm de diámetro y con 34–44 aperturas. Poro 3.0–3.3 μm; corpúsculos ectexinosos de la membrana 47–60, esparcidamente distribuidos en el centro del poro (el margen no tiene corpúsculos). La estructura de la membrana es metareticulada con elementos pentagonales y hexagonales. Mesoporios delgados, 0.3 μm de ancho. Tectum prolongado hacia las partes distales y reducido en las partes verticales, columelas cortas libres (visibles); la vista transversal del tectum tiene forma delgada triangular terminando en una punta aguda, 3 veces más alta que la columela; sin espínulas y con conexiones punteagudas.

Afinidades. Las especies más similares a *Gomphrena fuscipellita* por sus características morfológicas son *G. bicolor* Martius y *G. oligocephala* Remy. Estas dos especies son muy semejantes y según Pedersen (1976), la única diferencia es en el color de las brácteas y bractéolas; mientras que en *G. oligocephala* son blancas, en *G. bicolor* son cafés. Las características compartidas por *G. bicolor* y *G. oligocephala* como descritas por Holzhammer (1955, 1956) y *G. fuscipellita* son las inflorescencias compuestas de 6–7 capítulos con un mismo

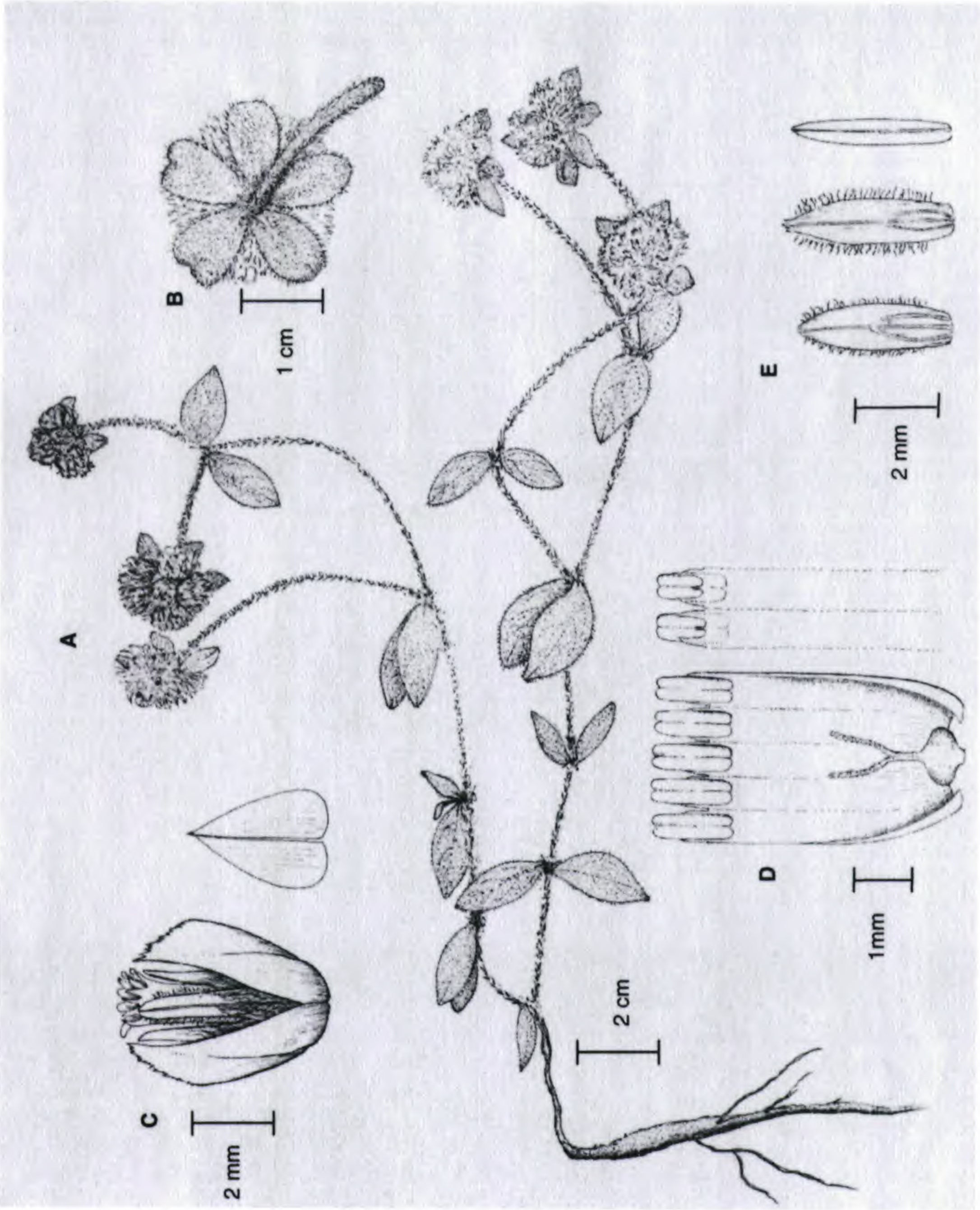

Figura 1. *Gomphrena fuscipellita* Ortuño & Borsch. —A. Hábito. —B. Hojas involucrales. —C. Flor con bractéolas y bráctea separada. —D. Vista interior del tubo del androeceo con gineceo y estigmas filiformes, vista exterior (derecha). —E. Tépalos, externo con 3 venas (izquierda), medio con tres venas, interno con una vena (derecha). (Dibujo del holotipo. *Borsch & Ortuño 3594*, LPB.)

número de hojas involucrales. Además, en estas especies las bractéolas tienen crestas dentadas en el ápice. El tubo estaminal de *G. fuscipellita* es similar al de *G. bicolor* (lóbulos entre las anteras unidos y con apariencia de pseudoestaminodios), aunque los lóbulos son más cortos: así en *G. fuscipellita* miden ca. 4 mm de largo y en *G. bicolor* miden hasta 8 mm de largo. Sin embargo, las brácteas de *G. fuscipellita* son muy parecidas a las de *G. oligocephala* ya que son blancas pero presentan una pequeña punta excurrente (< 2 mm).

Un tratamiento de *Gomphrena fuscipellita* como una especie distinta es justificada por varias características singulares, siendo la más notable la presencia de tricomas uniseriados fuscos densamente dispuestos en sus en sus órganos vegetativos. Además, los tallos en *G. fuscipellita* son ramificados dicotómicamente y sus hojas se distribuyen homogéneamente por toda la planta. Otra característica es que sus tallos siempre crecen inclinados hacia la pendiente, mientras que en *G. oligocephala* y *G. bicolor* los tallos crecen siempre rectos y no se ramifican, y la mayoría de las hojas se encuentran hacia la base de los tallos.

Los límites altitudinales donde fueron encontradas las poblaciones de *Gomphrena fuscipellita* (2280–2870 m) son parecidos a los de *G. oligocephala* (2500–3300 m), mientras que *G. bicolor* se encuentra en lugares con mayor altitud (3400–3900 m). Muestras revisadas de las dos primeras especies son elementos de la vegetación que crece sobre suelos arenosos y pedregosos en la región de los valles secos del sur de Bolivia (Cochabamba, Chuquisaca, Potosí). Al contrario, *G. bicolor* aparece distribuido más al norte hasta Perú encontrándose también en el bosque húmedo montano subtropical (3400 m) y en pastizales de la puna (3900 m).

Distribución y ecología. La mayoría de los especímenes revisados de *G. fuscipellita* proviene de la provincia de Mizque, departamento de Cochabamba, en un rango altitudinal de 2280 a 2870 m. *Gomphrena fuscipellita* crece en laderas con exposición este, con pendientes que varían de 25° a 35° sobre o cercana a afloramientos rocosos, en suelos con lutitas y pizarras, arenosos, algo arcillosos y rojizos, poco profundos, ligeramente ácidos y con poca materia orgánica acumulada, la cual está cubierta en la estación húmeda. Otras especies que crecen en el hábitat de *G. fuscipellita* son *Selaginella* spp., *Dodonaea viscosa* Royen ex Blume (chacatea), *Eupatorium buniifolium* Hooker & Arnott (tollita), *Croton* spp., *Salvia* spp., *Lepechinia* spp., *Stevia samaipatensis* B. L. Robinson, *Puya* spp., *Cheilantes pruinata* Kaulfuss y *Pellaea ternifolia* (Cavanilles) Link.

Paratipos. BOLIVIA. **Potosí:** Charcas, Toro Toro, cerro Manka Paqui entrando la quebrada Mula wacana, *J. Wood, M. Atahuachi & M. Mercado 19239* (BOLV, K, LPB). **Cochabamba:** Mizque, camino viejo de Raykampampa a Molinero, *T. Borsch & T. Ortuño 3608* (BONN, LPB); Raykampampa, Kollpana, *E. Gutiérrez 57* (BOLV); Ramadero, *A. López & E. Saravia 381* (BOLV); camino a herradura de Molineros hacia Botijas, *A. López & E. Saravia 151* (BOLV); Cantón Molinero a Raykampapa Ramadero, *M. Sigle* 237 (BOLV).

Gomphrena mizqueensis Ortuño & Borsch, sp. nov. TIPO: Bolivia. Cochabamba: Campero, Aiquile, camino nuevo de Raykampampa a Aiquile, a 1 hora de Aiquile, 18°11′57″S, 65°17′28″W, 2906 m, 4 abr. 2003. *T. Borsch & T. Ortuño 3614* (holotipo, LPB; isotipos, BOLV, BONN, K, MO). Figuras 2, 3B, 3D, 4B, 4D.

Herba annua radice tenui; caulibus erectis, trichotome ramosis, usque ad 40 cm altis, trichomatibus uniseriatis 2.0–3.5 mm longis hirsutis. Lamina foliaris ovata vel ovato-elliptica, 1.8–2.5 cm longa, 1.7–2.1 cm lata, dense pilosa. Inflorescentia terminalis vel axillaris, longe pedunculata, composita ex spicis (5 vel) 6 subglobosis congestis foliis involucralibus 5 (sicut foliis inferioribus dense pilosis) quam spicis longioribus subtentis constans; bractea elliptica, membranacea, glabra, 2.0–2.2 mm longa, dentata; bracteolis ovato-lanceolatis, membranaceis, flore aequilongis, 3.0–4.2 mm longis, dorsaliter crista apice denticulata munitis. Flos tepalis dissimilibus, glabris, scariosis, apice denticulatis, externis lanceolatis, 2.3–3.8 mm longis, ca. 0.6 mm latis, intermedio similis, sicut externis trichotomatibus undulatis paucis e base ortis, internis linearibus, 2.1–3.6 mm longis, ca. 0.4 mm latis; filamentorum tubi lobulis ca. 0.6 mm longis, vicinis connatis pseudostaminodia formantibus; antheris 1.0–1.2 mm longis; stigmate in ramos filiformis desinente.

Hierba anual, tallos erectos, muy ramificados en la parte superior y divididos tricotómicamente, 35–40 cm de largo, el color varía de verde a rojizo, laxamente pilosos con tricomas ± adpresos, de blancos o pálido amarillos, uniseriados, 2.0–3.5 mm de largo, con 8–9 células, la célula basal más amplia, las paredes celulares con gránulos. Hojas opuestas, subpecioladas, láminas ovadas, 1.8–2.5 × 1.7–2.1 cm, ápice agudo a ligeramente acuminado, base decurrente, superficie densamente pilosa, con tricomas adpresos similares a los del tallo. Inflorescencias erectas, con pedúnculos de 1.0–14 cm de largo, capítulos solitarios de 0.6–2.5 cm de diámetro, terminales o axilares, compuestos de 6 espigas subglobosas, protegidas por 5 hojas involucrales. Hojas involucrales de color verde claro en la superficie adaxial, y de color verde pálido en la superficie abaxial, ovado-lanceoladas, sésiles, 0.5–1.9 × 0.2–0.6 cm, densamente pilosas con tricomas similares a los de las hojas. Espiga con flores apicales más pequeñas, pero manteniendo el tamaño

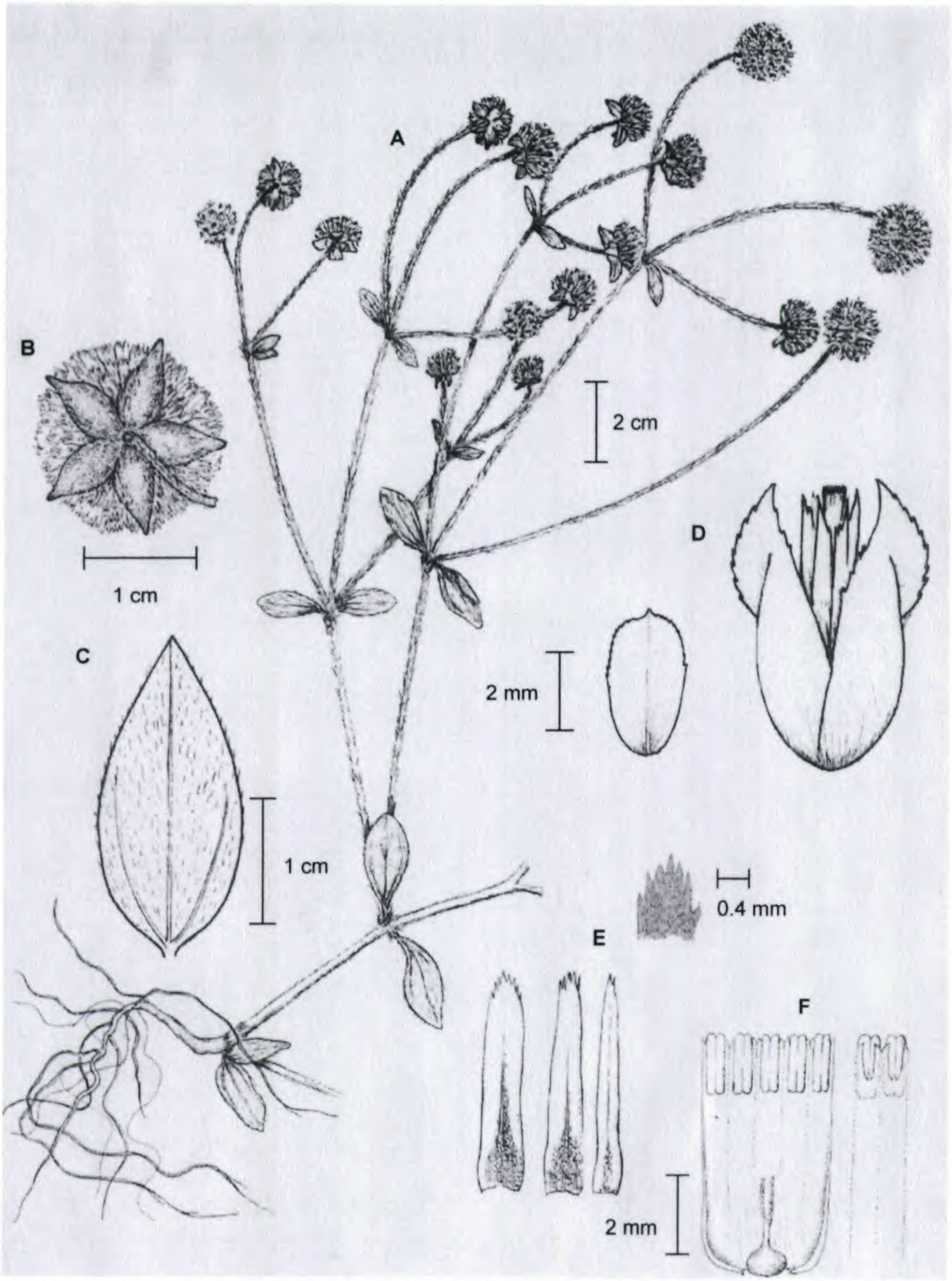

Figura 2. *Gomphrena mizqueensis* Ortuño & Borsch. —A. Hábito. —B. Hojas involucrales. —C. Hoja. —D. Flor con bractéolas y bráctea separada. —E. Tépalos, externo (izquierda), medio, interno (derecha) y un acercamiento del ápice del tépalo externo. —F. Vista interior del tubo del androceo con gineceo y estigmas filiformes, vista exterior (derecha). (Del holotipo, *Borsch & Ortuño 3614*, LPB.)

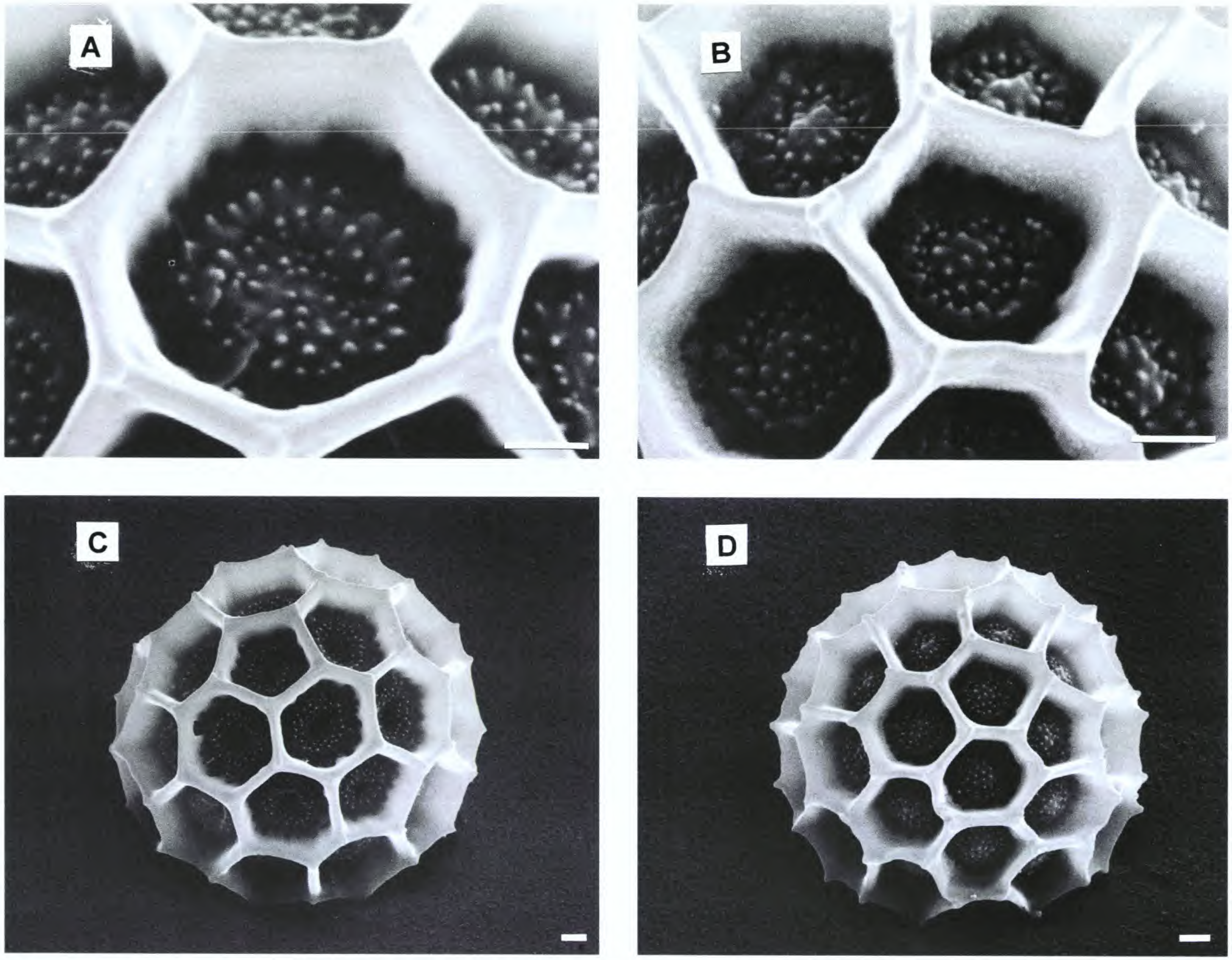

Figura 3. Fotomicrografías del polen en MEB, polen limpiado con dimethoxypropano y acetona (secado en el punto crítico). —A, C. *Gomphrena fuscipellita* (isotipo, *Borsch & Ortuño 3594*, BONN). —B, D. *Gomphrena mizqueensis* (isotipo, *Borsch & Ortuño 3614*, BONN). La escala es igual a 1.0 μm.

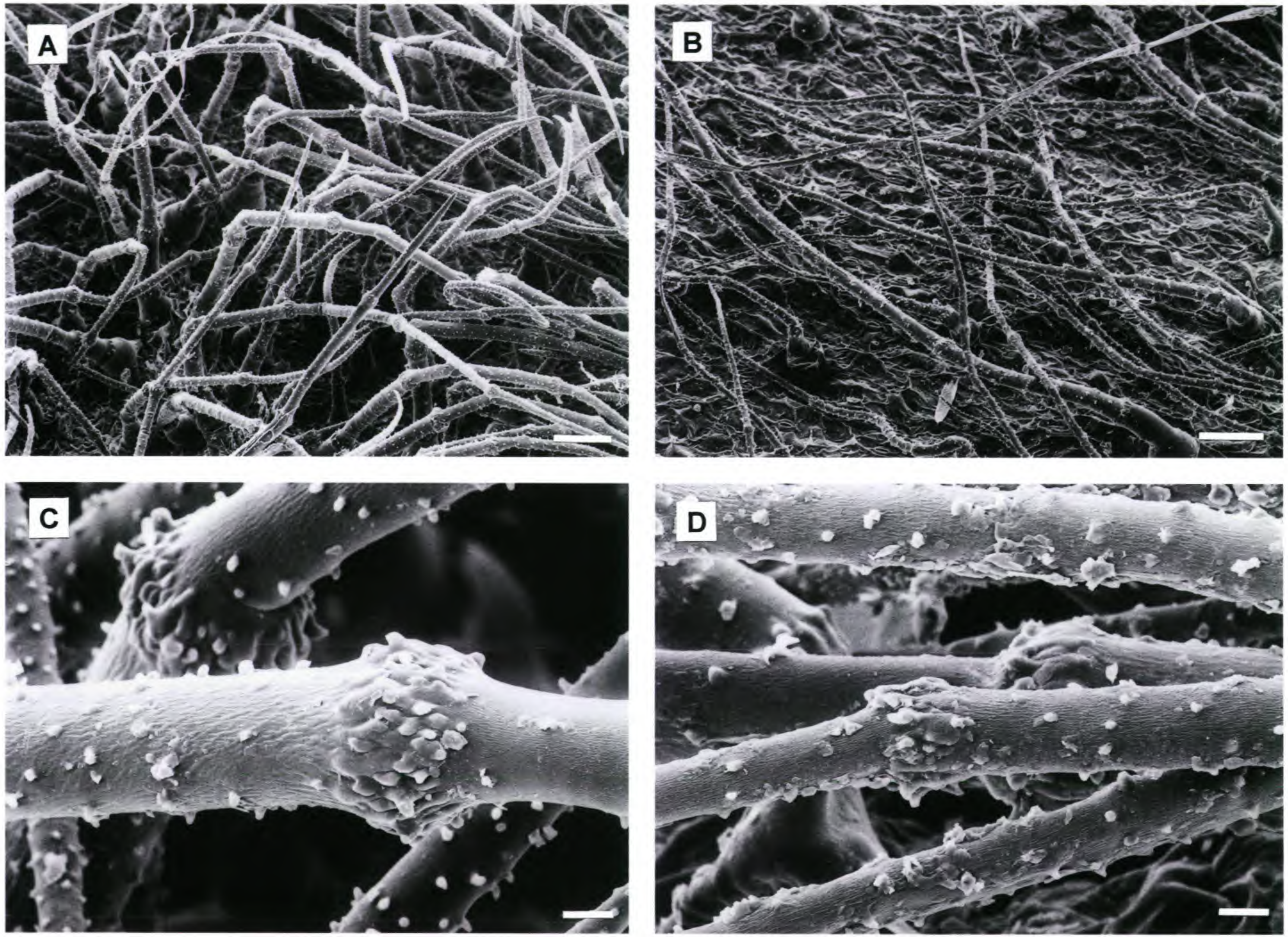

Figura 4. Fotomicrografías de pelos en MEB, envés de las hojas, en grupo (arriba) y un detalle de la unión de las células. —A, C. *Gomphrena fuscipellita* (isotipo *Borsch & Ortuño 3608*, BONN). —B, D. *Gomphrena mizqueensis* (isotipo, *Borsch & Ortuño 3614*, BONN). La escala en A y B es igual a 100 μm, en C y D a 10 μm.

de sus estructuras reproductivas (gineceo, anteras); brácteas elipsoides, cimbiformes, membranosas, hialinas, llegando ± a la mitad de la altura de la flor, 2.0–2.1 × 1.2 mm, con 1 nervadura excurrente (0.1 mm), bordes dentados en la parte apical; bractéolas ovadas, cimbiformes, membranosas, glabras, blancas, de igual tamaño que la flor, 3.0–4.2 × 1.0 mm, en la parte dorsal presentan una cresta ubicada en el ⅓ superior, distalmente dentada. Tépalos desiguales, 5, los dos externos lanceolados, 2.3–3.8 × 0.6 mm, escariosos, con los ápices dentados, glabros, no se distingue claramente el número de nervios, el tépalo intermedio similar a los externos, 2.2–3.7 × 0.5–0.6 mm, los internos lineales, a veces encorvados, 2.1–3.6 × 0.4 mm, 1-nervados, escariosos, con margen glabro; tricomas blancos ondulados de 3 mm, saliendo de la base de los tépalos, en algunas flores más densos que en otras; filamentos 1.5–4.6 mm de largo, completamente unidos formando un tubo, lóbulos (lóbulos de los estambres vecinos unidos parecidos a pseudoestaminodios) unidos a la mitad, 0.6 mm de largo; anteras de 1–1.2 mm de largo; gineceo subgloboso, 0.2–0.4 mm; estilo 0.2–0.4 mm; estigma de 0.6 mm, con ramas filiformes.

Polen esferoidal, de 13.0–14.0 μm de diámetro y con 30–37 aperturas. Poro 1.6–1.8 μm; corpúsculos ectexinosos de la membrana 33–38, con forma irregular, densamente distribuidos en todo el poro. La estructura de la membrana es metareticulada con elementos penta- y hexagonales. Mesosporios delgados, 0.3 μm de ancho. Tectum prolongado hacia las partes distales y completo en las partes verticales, columelas no visibles; la vista transversal del tectum tiene forma delgada triangular terminando en una punta aguda; con espínulas.

Afinidades. *Gomphrena mizqueensis*, al igual que *G. ferruginea* Pedersen, *G. pallida* (Suessenguth) Pedersen y *G. phaeotricha* Pedersen es también una especie anual. Estas especies se distribuyen en los valles secos de Bolivia y en el chaco serrano, la prepuna y en valles secos de monte de Argentina. Debido a que las cuatro especies son morfológicamente similares, se presenta una clave para distinguirlas. La información sobre los caracteres de *G. ferruginea*, *G. pallida*, *G. phaeotricha* se obtuvo de Pedersen (1976).

Clave para Especies Anuales Cercanas a *G. mizqueensis* (para Flores en Estado Maduro)

1. Brácteas cimbiformes, nervio cortamente excurrente, con bordes dentados en la parte apical; ápice de los tépalos dentado . . *G. mizqueensis*
1′. Brácteas ovado-lanceoladas, agudas (nervio no excurrente), con margen liso; ápice de los tépalos liso o algo aserrulado 2
2(1). Bractéolas ⅔ más largas que los tépalos; cresta con dientes notorios . . . . . *G. ferruginea*
2′. Bractéolas iguales o un poco más largas que los tépalos; cresta ± entera (dientes solamente cerca del ápice) 3
3(2). Tépalos internos más cortos, sin tricomas ondulados . . . . . *G. phaeotricha*
3′. Tépalos internos iguales en longitud, con tricomas ondulados . . . . . *G. pallida*

Suessenguth (1940) describió *Gomphrena oligocephala* var. *pallida* Suessenguth sobre la base de una planta anual colectada por Rodriguez (sub no. 1420, 22 Mar. 1914, LIL, LP, M). Pedersen (1976) presentó claras diferencias entre var. *pallida* y *G. oligocephala*, y transfirió la variedad a nivel de especie (*G. pallida*). Debido a que *Gomphrena mizqueensis* y *G.* pallida crecen simpátricamente, es necesario puntualizar todas sus diferencias. *Gomphrena mizqueensis* es una planta alta (hasta 40 cm), erecta, con más ramas y hojas en la parte superior. Sus hojas son ovadas y presentan un par de nervaduras tan evidentes como el nervio central. Las plantas tienen un indumento denso en los tallos con tricomas que alcanzan 3.5 mm. Las hojas involucrales presentan poca variación en el tamaño y están regularmente distribuidas. El ápice de los tépalos es dentado y los filamentos están completamente fusionados con los lóbulos unidos (parecen ser pseudoestaminodios). Mientras que, *G. pallida* es una planta pequeña (15 cm), ramificada desde la base, con hojas oblanceoladas y varios pares de nervios tan evidentes como el nervio central. El indumento presenta tricomas de hasta 6 mm de longitud que están esparsamente distribuidos en los tallos. Las hojas involucrales son notoriamente variables en el tamaño y el ápice de los tépalos es aserrulado. Los filamentos están fusionados parcialmente en un 90% con lóbulos laterales y libres. Investigaciones moleculares preliminares sugieren que *G. mizqueensis* es muy distinta a *G. pallida*, mientras que es más afín a *G. fuscipellita* (Ortuño & Borsch, inéd.).

Existen otras especies anuales que crecen en esta región como *Gomphrena boliviana* Mart., *G. martiana* Gillies ex Moquin-Tandon, *G. platycephala* R. E. Fries y *G. tarijensis* R. E. Fries, pero éstas especies son morfologicamente diferentes y pertenecen a otras líneas de *Gomphrena*. Al contrario de las anuales incluidas en la clave, *G. martiana* y especies afínes presentan pequeños lóbulos perpendiculares al tubo del androceo. Además de estas cuatro especies, existen dos especies anuales más pequeñas (*G. umbellata* Remy y *G. radiata* Pedersen), que se diferencian por presentar el an-

droceo sin lobos y las bractéolas sin nervios. De los sistemas de clasificación realizados por Seubert (1875), Holzhammer (1955, 1956) y Siqueira (1992), las especies aquí nombradas solo están incluidas en los trabajos de Holzhammer (1955, 1956) ya que estos son más amplios geográficamente. Así *G. oligocephala* Remy, *G. bicolor* Martius y *G. pallida* (Suessenguth) Pedersen [sub *G. oligocephala* var. *pallida* Suessenguth] pertenecen a la sección *Gomphrena*; *G. umbellata* a la sección *Chnoanthus* (Philippi) R. E. Fries; y *G. martiana* s.l. con especies afines están en *Gomphrenula* Seubert. Estas secciones fueron separadas por algunos caracteres morfológicos (tipo de inflorescencia, presencia de cresta en bractéolas), pero está por determinarse si estos caracteres son plesiomórficos o apomórficos en los análisis filogenéticos que están siendo efectuados.

Distribución y ecología. Las muestras analizadas de *G. mizqueensis* provienen de las provincias Mizque y Campero en un rango altitudinal de 2900 a 3600 m, creciendo frecuentemente en suelos pedregosos de material suelto de pizarra, y junto a especies como *Kageneckia lanceolata* Ruiz & Pavón, *Schinopsis haenkeana* Engler, *Dodonaea viscosa*, *Gomphrena pallida* y *Salvia* spp. La mayoría de las plantas fueron encontrados en Mizque; el nombre *Gomphrena mizqueensis* hace referencia a esta provincia, que es conocida por sus valles secos. Se designó el tipo de esta especie a una colección de la provincia Campero porque el material es de mejor calidad.

Paratipos. BOLIVIA. **Cochabamba:** Mizque, camino de Mizque a Aiquile, segundo puente antes de llegar a Mizque, *T. Borsch & T. Ortuño 3584* (BONN, LPB); cumbres entre Rakaypampa y Lagunas, *C. Antezana 796* (BOLV, BONN, LPB).

Conservación

La principal amenaza de la especie *Gomphrena fuscipellita* está relacionada con la pérdida de hábitat, especialmente cerca de las localidades de Raykampampa y Aiquile. Esto se debe a la implementación de cultivos extensivos y monocultivo sin descanso, lo que además de causar una fuerte degradación de la vegetación xerófila natural ha provocado la introducción de plagas por la utilización de semillas infestadas (Sigle, 1988). Por otro lado, el sobrepastoreo de animales como cabras, ovejas, cerdos, vacas, acrecienta el peligro de la erosión. *Gomphrena mizqueensis* fue encontrada en lugares más pedregosos, por lo cual, existe menos en áreas cultivadas y al parecer no está siendo afectada por actividades humanas. Este trabajo podría ser una base e incentivo para que en el futuro se complemente con más información sobre las dos especies.

Vale recalcar que estas especies, *Gomphrena fuscipellita* y *G. mizqueensis*, están distribuidas dentro de los valles secos de Bolivia que constituyen ecosistemas diversos en especies vegetales, con 1300 especies registradas y potencialmente más de 2000, además de presentar un alto nivel de endemismos, con un 18% de las especies nativas (López, 2003). Razón por la cual los trabajos como el de Navarro et al. (1996), Antezana y Navarro (2002), López y Beck (2002), apuntan a conseguir mecanismos estatales para resguardar estas zonas de importancia biológica por el riesgo y deterioro irreversible en que se encuentran grandes extensiones con este tipo de vegetación.

Agradecimientos. Este trabajo es parte del proyecto "Sistemática y diversidad de las Amarantáceas de Bolivia", realizado en colaboración con el Herbario Nacional de Bolivia, Museo Nacional de Historia Natural y el Nees-Institut für Biodiversität der Pflanzen de la Universidad de Bonn. Damos las gracias a la Dirección General de Biodiversidad, La Paz, por los permisos legales; a la Deutsche Forschungsgemeinschaft (DFG) por la financiación del proyecto (número de proyecto BO 1815-1/1); al DAAD por brindarnos una beca para T.O. para realizar estudios en Bonn; Darwin Initiative for the Conservation of Species para el financiamiento de una parte del trabajo de T.O.; a los curadores del herbario BOLV y los curadores de los otros herbarios mencionados por prestar muestras, a Ramiro López, Carola Antezana, Jasivia Gonzaléz, Kai Müller, Nelson Loza, John Wood y Stephan Beck por sus útiles aportaciones; a Ivonne Sánchez del-Pino y Alina Freire Fierro por comentarios a este manuscrito, a Roy Gereau por revisar el texto en latin, a Carlos Maldonado por su colaboración con los dibujos y a Valentín Franco Ramírez por su apoyo en el trabajo de campo.

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New Species and Nomenclatural Notes in Mesoamerican *Ardisia* (Myrsinaceae)

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ABSTRACT. Taxonomic study of the Myrsinaceae for the *Flora Mesoamericana* treatment resulted in the discovery of three new species from Panama, which are described and illustrated: *Ardisia herrerana* Pipoly & Ricketson of subgenus *Ardisia*, and *A. nana* Pipoly & Ricketson and *A. pseudocuspidata* Pipoly & Ricketson, both of subgenus *Icacorea*. In addition, two new combinations within *Ardisia* subg. *Icacorea* are made: *Ardisia mexicana* subsp. *siltepecana* (Lundell) Pipoly & Ricketson and *Ardisia furfuracella* subsp. *veraguasensis* (Lundell) Pipoly & Ricketson, the latter with two heterotypic binomials newly relegated to synonymy (*A. oerstediana* Lundell and *A. caudatifolia* Lundell). Finally, we lectotypify *Ardisia compressa* Kunth var. *mexicana* Oersted, a new taxonomic synonym, and place *A. jaliscensis* Lundell into synonymy of *A. mexicana* Lundell subsp. *mexicana*.

RESUMEN. El estudio taxonómico de la familia Myrsinaceae para el proyecto *Flora Mesoamericana* resultó en el descubrimiento de tres nuevas especies panameñas las cuales se describen e ilustran: *Ardisia herrerana* Pipoly & Ricketson del subgénero *Ardisia*, *A. nana* Pipoly & Ricketson y *A. pseudocuspidata* Pipoly & Ricketson, ambas del subgénero *Icacorea*. Además, se proponen dos combinaciones nuevas dentro de *Ardisia* subg. *Icacorea*: *Ardisia mexicana* subsp. *siltepecana* (Lundell) Pipoly & Ricketson y *Ardisia furfuracella* subsp. *veraguasensis* (Lundell) Pipoly & Ricketson, y como novedad se relega a la sinonimia de la última subespecie a dos binomios heterotípicos (*A. oerstediana* Lundell y *A. caudatifolia* Lundell). Finalmente, se lectotipifica *Ardisia compressa* Kunth var. *mexicana* Oersted, un nuevo sinónimo taxonómico, y se ubica a *A. jaliscensis* Lundell como sinónimo de *A. mexicana* Lundell.

Key words: *Ardisia*, *Ardisia* subg. *Ardisia*, *Ardisia* subg. *Icacorea*, conservation assessment, *Flora Mesoamericana*, lectotypifications, Mexico, Myrsinaceae, Panama.

The pantropical genus *Ardisia* Swartz is the largest in the family Myrsinaceae, containing perhaps as many as 500 species (Chen & Pipoly, 1996). Its circumscription has been problematic due to the lack of a comprehensive treatment since that of Mez (1902). The genus has traditionally been separated from all others in the Myrsinaceae by what he interpreted as free filaments, and by pluriseriate ovules (Mez, 1902). Pipoly and Ricketson (1998) found that the stamens in all subgenera are actually connate basally by their filaments to form a hyaline, inconspicuous tube, but that the tube is free from the corolla. The hyaline staminal tube, free from the corolla tube, is the only unique characteristic that distinguishes *Ardisia* from the other genera of the family, and thus defines it.

While preparing the taxonomic treatment of *Ardisia* for inclusion in the Myrsinaceae for *Flora Mesoamericana*, one new species was discovered within *Ardisia* subg. *Ardisia* and two additional ones from subgenus *Icacorea* (Aublet) Mez. Also, two new combinations were found to be needed, and three binomials are relegated to synonymy. Finally, while working up the synonymy for *Ardisia mexicana*, it was determined that one of its newly proposed taxonomic synonyms, *A. compressa* var. *mexicana*, needed to be lectotypified.

Ardisia Swartz subg. **Ardisia**

Ardisia subg. *Ardisia*, as will be circumscribed in the upcoming *Flora Mesoamericana* treatment, comprises 11 species in Mesoamerica. Members of this group are mostly locally common, occur in forest margins and survive moderate levels of disturbance (Pipoly, unpublished), and their ripe black

to purple-black fruits provide a large food source for birds, as well as the humans that live in their habitats. They are easily propagated by cuttings (Grijalva, pers. comm.).

KEY TO MESOAMERICAN *ARDISIA* SUBG. *ARDISIA*

1a. Pedicels covered with minute papillae, or simple multicellular trichomes.
  2a. Calyx lobes 2.5 mm or longer . . . . . *A. herrerana* Pipoly & Ricketson
  2b. Calyx lobes smaller, less than 2.2 mm.
    3a. Pedicels of mature flowers 0–3 mm . . . . . *A. bracteosa* A. DC.
    3b. Pedicels of mature flowers longer, slender, 4–7 mm.
      4a. Leaf blades coriaceous, generally over 10 cm; pistil 6.1–6.8 mm, the ovary 1.4–1.6 mm, the styles 4.5–5.2 mm; mature fruits 3–5 mm diam . . . . . *A. revoluta* Kunth
      4b. Leaf blades chartaceous, generally under 10 cm; pistil 7–8.4 mm, the ovary 1.6–2 mm, the styles 6.4–6.6 mm; mature fruits 5–7 mm diam . . *A. escallonoides* Schlechtendal & Chamisso
1b. Pedicels glabrous.
  5a. Base of peduncle and apex of the branchlet with minute, dense papillae, and/or with simple multicellular trichomes.
    6a. Inflorescence as long as or longer than the leaves; pedicels 6.2–12.4 mm . . *A. colombiana* Lundell
    6b. Inflorescence much shorter than the leaves; pedicels 0–4.5 mm . . . . . *A. granatensis* Mez
  5b. Base of peduncle and apex of the branchlet glabrous.
    7a. Anthers versatile, 1.5–1.6 × 0.4–0.5 mm . . . . . *A. breedlovei* Lundell
    7b. Anthers basifixed, more than 2 × 0.6 mm.
      8a. Pedicels of mature flowers or fruits more than 6 mm . . . . . *A. paschalis* Donnell Smith
      8b. Pedicels of mature flowers or fruits 0–6 mm.
        9a. Leaf blades membranaceous, 2.8–3.6 cm; flowers small, calyx lobes 1.3–1.6 mm, essentially epunctate; corolla lobes 2.9–3.1 mm; stamens 2.4–2.5 mm, anthers 2.3–2.5 mm . . . . . *A. escuintlensis* Lundell
        9b. Leaf blades chartaceous to coriaceous, 3.8–11.7 cm; flowers larger, calyx lobes 3.2–7.5 mm, punctate; corolla lobes 6.7–12.8 mm; stamens 6.9–11.2 mm, anthers 2.8–6.9 mm.
          10a. Calyx lobes 3.2–6.2 mm; corolla lobes 6.7–10 mm, the corolla tube 2–4.7 mm; the anthers 2.8–5.4 mm × 1.1–1.9 mm . . . . . *A. foetida* Willdenow ex Roemer & Schultes
          10b. Calyx lobes 7–7.5 mm; corolla lobes 12.2–12.8 mm, the corolla tube 1–1.2 mm; the anthers 6.6–6.9 mm × 1.9–2.2 mm . . . . . *A. perinsignis* Lundell

1. Ardisia herrerana Pipoly & Ricketson, sp. nov. TYPE: Panama. Darién: Parque Nacional Darién, trail between Estación Pirré and Cerro Pirré, 08°00′N, 077°45′W, 100–300 m, 11 Feb 1991 (fl, fr), *H. Herrera 945* (holotype, MO; isotypes, F, FTG, PMA not seen). Figure 1.

Haec species quoad folia magna pedicellos papillosotomentosos atque lobulos calycinos magnos *A. cabrerae* arcte affinis, sed ab ea laminis foliaribus chartaceis (non coriaceis) ad apices acutis (nec acuminatis), inflorescentiarum pinnatarum (non bipinnatarum) ramulis 20 ad 40 (nec 7 ad 11)-floribus, pedicellis 5.3–7.3 (nec 2.4–5) mm longis, lobulis calycinis 3.1–3.4 mm (non 2.7–2.9) mm longis ad apices rotundatis (nec obtusis), lobulis corollinis ellipticis usque lanceolatis (non ovatis) 5.8–6.3 × 2.6–2.9 (non 4.3–4.5 × 3.4–3.5) mm, staminibus 6.4–6.7 (non 3.5–3.7) mm longis, denique antheris 1.7–1.9 (non 1.1–1.2) mm latis statim separabilis.

Trees to 9 m tall. *Branchlets* slender, terete, 6–8 mm diam., densely and minutely papillose, with scattered to dense, prominent lenticels. *Leaves* with blades chartaceous, oblong, elliptic, or oblanceolate, 27–35 × 9.5–11.2 cm, apically acute, the acumen 0.5–1.3 mm long, basally cuneate, decurrent on the petiole, inconspicuously punctate and punctate-lineate, glabrous, the midrib impressed above, prominently raised below, the secondary veins 52 to 70 pairs, prominulous above and below, the margins entire, flat; petioles slender, marginate, 2.5–3 cm long, glabrous except often densely and minutely papillose basally. *Inflorescence* terminal, a pinnate panicle of racemes, 20–27 × 13–17 cm, usually shorter than the leaves, densely and minutely papillose, the branches bearing 20 to 40 flowers each; the peduncle 1.3–5.2 cm long, the lower branches subtended by leaves, densely and minutely papillose or with minute simple multicellular trichomes; inflorescence primary bract and branch bracts unknown (only scars visible); secondary branches 0.9–2.6 cm long; floral bracts caducous, membranous, ovate, 9–21 × 7–15 mm, apically acute, prominently punctate and punctate-lineate, glabrous within, densely and minutely papillose or with minute simple multicellular trichomes without, the margins entire, hyaline, sparsely glandular-ciliolate; pedicels slender, terete, 5.3–7.3 mm long, inconspicuously punctate and punctate-lineate, densely and minutely papillose or with minute simple multicellular trichomes.

Figure 1. *Ardisia herrerana* Pipoly & Ricketson. —A. Flowering branch. —B. Flower. —C. Detail of stamen and petal, showing dense yellow papillae. —D. Fruit. A–D drawn from the holotype, *H. Herrera 945* (MO).

Flowers 5-merous; calyx lobes chartaceous, ovate, 3.1–3.4 × 3.2–3.5 mm, apically rounded, conspicuously punctate and punctate-lineate, glabrous except with sparse minute cupulate scales within, the margins entire, hyaline, sparsely ciliolate; corolla white, membranous, 8.4–8.7 mm long, the tube 2.4–2.6 mm long, the lobes elliptic to lanceolate, 5.8–6.3 × 2.6–2.9 mm, apically acute to rounded,

conspicuously punctate and punctate-lineate, glabrous except with dense yellow papillae basally within, the margins entire, hyaline; stamens 6.4–6.7 mm long, the filaments 4–4.2 mm long, the staminal tube 1.4–1.7 mm long, the apically free portion 2.4–2.6 mm long, inconspicuously punctate and punctate-lineate, glabrous, the anthers free, lanceolate, 2.2–2.5 × 1.7–1.9 mm, apically apiculate, basally subcordate, the connective inconspicuously punctate; pistil unknown. *Fruit* (immature) green, globose, 3.5–5.5 mm diam., conspicuously and prominently punctate and punctate-lineate.

Distribution. *Ardisia herrerana* is endemic to the Parque Nacional Darién, on Cerro Pirré in Darién Province, Panama, growing from 100 to 300 m elevation.

Ecology and conservation assessment. *Ardisia herrerana* is an apparent point endemic. There have been a number of large-scale botanical expeditions to Cerro Pirré, and the existence of only one collection points to the species' rarity. According to IUCN (2001) Red List criteria, this species would be critically endangered (CRB2aD), owing to (B) area of occupancy estimated to be less than 10 km^2 and (2a) known only from one collection, so (D) the total population size estimated at less than 50 mature individuals. Although *A. herrerana* occurs in Parque Nacional Darién, and its remote location reduces threat, there remains the possibility of threat from unforeseen factors (treefalls, storms, etc.).

Etymology. This taxon is named for Heraclio Herrera, its collector.

Ardisia herrerana belongs to *Ardisia* subg. *Ardisia*, which is circumscribed by racemose to spicate inflorescence branches; calyx lobes symmetrical, longer than wide, and not auriculate basally, glandular-granulose adaxially at the base, and without a subapical notch along the margin. *Ardisia herrerana* could initially be confused with the common species *A. revoluta* by its general leaf shape, size, and large inflorescence. However, *Ardisia herrerana* is easily distinguished from *A. revoluta* by its minutely papillose (not glabrous) branchlets; calyx lobes chartaceous (not membranaceous), 3.1–3.4 × 3.2–3.5 (not 1.9–2.1 × 1.6–1.8) mm, apically rounded (not acute); corolla 8.4–8.7 (not 7.4–7.8) mm long, and by its stamens 6.4–6.7 (not 5.1–5.3) mm long.

Ardisia herrerana is most similar to *A. cabrerae* Pipoly because of its large leaves, long pedicels that are densely covered with minute papillae and/or simple multicellular trichomes, and the large calyx lobes. However, *A. herrerana* differs from *A. cabrerae* by its chartaceous (not coriaceous) and apically acute (not acuminate) leaf blades, its pinnate (not bipinnate) inflorescence, its inflorescence branches with 20 to 40 flowers (not 7 to 11), its pedicels 5.3–7.3 (not 2.4–5) mm long, its calyx lobes 3.1–3.4 (not 2.7–2.9) mm long, and apically rounded (not obtuse), its corolla lobes elliptic or lanceolate (not ovate) and 5.8–6.3 × 2.6–2.9 (not 4.3–4.5 × 3.4–3.5) mm, its stamens 6.4–6.7 (not 3.5–3.7) mm long, and its anthers 1.7–1.9 (not 1.1–1.2) mm wide.

Ardisia Swartz subg. **Icacorea** (Aublet) Mez

Ardisia subg. *Icacorea*, as will be circumscribed in the upcoming *Flora Mesoamericana* treatment, comprises 31 species with 33 taxa in Mesoamerica. Of these, 12 are widespread, highly variable forest margin and gap species, with extensive quantitative plasticity in morphological characters that has led to much taxonomic over-description. Members of this group are mostly locally common, and because they produce so many bright red fruits per panicle, they provide a large food source for birds. They have broad ecological tolerance, and thus would be suitable for early introduction in any forest restoration effort.

The key below includes the new species and presents our revised circumscriptions of *Ardisia furfuracella* and *A. mexicana*. Vegetative or fruiting calyx characters are used whenever possible to facilitate identification, because the majority of herbarium specimens are in fruit. Terminology used here follows that of Ricketson and Pipoly (2003).

KEY TO MESOAMERICAN *ARDISIA* SUBG. *ICACOREA*

1a. Inflorescences axillary and terminal (sometimes apparently terminal, but with axillary inflorescence buds easily visible).
  2a. Leaf margins entire.
    3a. Leaf apex short-acuminate to subacuminate, the base acute and decurrent on the petiole, but not to its base; branchlets without interpetiolar ridges or angles.
      4a. Branchlets, leaves, and inflorescences glabrous; anthers 3.2–3.4 mm long; styles 4.1–4.3 mm long . . . . . *A. alajuelae* (Lundell) Pipoly & Ricketson
      4b. Branchlets, leaves, and inflorescences furfuraceous-lepidote; anthers 2.8–3.2 mm long; styles 4.4–5.2 mm long . . . . . *A. hintonii* Lundell

3b. Leaf apex long-acuminate to caudate or cuspidate, the base cuneate, rounded or obtuse, and decurrent on the petiole to its base; branchlets with sharp angles or interpetiolar ridges.
5a. Leaf decurrent to petiole base and on stem; branchlets with interpetiolar ridges.
6a. Leaf blades coriaceous, apically acuminate but not caudate; petioles canaliculate; calyx lobes 1.2–2.2 mm wide; corolla lobes 4.5–6 × 2–2.4 mm . . . . . *A. fendleri* Lundell
6b. Leaf blades membranous to chartaceous, apically caudate; petioles marginate; calyx lobes 0.5–1.2 mm wide; corolla lobes 2.9–4.6 × 1.6–2.1 mm . . *A. furfuracella* Standley
7a. Leaf blades membranous, essentially glabrous below, except sparsely to densely and minutely furfuraceous-lepidote along the midrib; pedicels glabrous; calyx lobes 1.4–1.6 × 1–1.3 mm; corolla lobes 4.4–4.6 × 1.7–2.1 mm; anthers 2.2–3.1 mm long; styles 4.7–5.3 mm long . . . . . *A. furfuracella* subsp. *veraguasensis* (Lundell) Pipoly & Ricketson
7b. Leaf blades chartaceous, sparsely and minutely furfuraceous-lepidote below, the scales denser along the midrib; pedicels with scattered, minute furfuraceous-lepidote indument; calyx lobes 0.9–1.2 × 0.5–1 mm; corolla 2.9–3.2 × 1.6–1.8 mm; anthers 1.6–1.9 mm long; styles 3.6–3.9 mm long . . . . . *A. furfuracella* Standley subsp. *furfuracella*
5b. Leaf base decurrent to petiole base, but not on stem; branchlets with angles, but without interpetiolar ridges.
8a. Leaf blades chartaceous, basally cuneate; calyx lobes 1.3–1.5 × 1.1–1.3 mm; styles 4.6–5.3 mm long . . . . . *A. brevis* Lundell
8b. Leaf blades membranous, basally obtuse to rounded; calyx lobes 1–1.3 × 0.8–1.1 mm; styles 2.9–3.8 mm long.
9a. Corolla lobes 2.3–2.6 × 1.1–1.4 mm; anthers 1.4–1.6 × 0.5–0.7 mm; styles 2.9–3.2 mm long; fruits 3.5–4.5 mm diam.; Cocos Island . . . . . *A. cuspidata* Bentham
9b. Corolla lobes 3.2–3.5 × 1.7–1.9 mm; anthers 1.8–2 × 0.7–0.9 mm; styles 3.5–3.8 mm long; fruits 5–6 mm diam.; southern Darién/northern Chocó . . . . . *A. pseudocuspidata* Pipoly & Ricketson

2b. Leaf margins undulate, crenulate, dentate or serrate.
10a. Flowers 4- or 5-merous in the same inflorescence . . . . . *A. guianensis* (Aublet) Mez
10b. Flowers strictly 5-merous.
11a. Corolla lobes 4.9–6.2 mm long; anthers 3.7–4.4 mm long; Mexico to Guatemala . . . . . *A. mexicana* Lundell
12a. Calyx lobes 1.2–1.4 mm long, apically acute; corolla lobes 6–6.2 mm long; anthers 4.1–4.4 × 0.6–0.8 mm; styles 6–6.2 mm long . . . *A. mexicana* Lundell subsp. *mexicana*
12b. Calyx lobes 0.9–1.2 mm long, apically rounded; corolla lobes 4.9–5.2 mm long; anthers 3.7–3.9 × 1.8–2 mm; styles 4.9–5.3 mm long . . . . . *A. mexicana* subsp. *siltepecana* (Lundell) Pipoly & Ricketson
11b. Corolla lobes 3.8–4.3 mm long; anthers 2.2–2.8 mm long; Nicaragua to Panama.
13a. Leaf margins serrate-dentate; calyx lobes 1.3–1.4 × 1.2–1.4 mm; anthers 2.2–2.4 mm long . . . . . *A. longicaudata* Lundell
13b. Leaf margins undulate to crenulate; calyx lobes 1–1.3 × 0.6–0.8 mm; anthers 2.4–2.8 mm long . . . . . *A. fruticosa* Lundell

1b. Inflorescences strictly terminal, with no axillary buds visible at nodes below.
14a. Inflorescence a compact, ovoid capitulum . . . . . *A. glomeriflora* J. F. Morales
14b. Inflorescence an open panicle.
15a. Leaf margins undulate, crenulate, serrate or dentate.
16a. Styles 3.5–4.5 mm long.
17a. Ultimate branches of inflorescence racemose; calyx lobes 1.3–1.5 mm long; corolla lobes 4.4–4.7 × 2–2.2 mm; anthers 2.9–3.1 mm long . . . . . *A. geniculata* Lundell
17b. Ultimate branches of inflorescence corymbose; calyx lobes 0.9–1.3 mm long; corolla lobes 3.7–4.2 × 1.5–1.9 mm; anthers 1.9–2.5 mm long.
18a. Branchlets with conspicuous interpetiolar ridges; styles 4.2–4.5 mm long . . . . . *A. amanuensis* Lundell
18b. Branchlets terete or angled, without interpetiolar ridges; styles 3.5–3.8 mm long . . . . . *A. irasuensis* Oersted
16b. Styles 5.4–6.1 mm long.
19a. Inflorescences 2.5–3.2 × 0.9–1.5 cm; calyx lobes 0.9–1 mm wide . . . *A. cookii* Lundell
19b. Inflorescences 4–24 × 3–21 cm; calyx lobes 1–1.3 mm wide.
20a. Anthers 2.9–3.2 mm long; styles 5.9–6.1 mm long . . . . . *A. subcrenulata* Lundell
20b. Anthers 3.4–4 mm long; styles 5.4–5.9 mm long . . . . . *A. compressa* Kunth
15b. Leaf margins entire.
21a. Leaf blades membranous to chartaceous.
22a. Calyx lobes 0.6–0.8 × 0.6–0.8 mm; corolla lobes 3–3.4 × 1.7–1.9 mm; anthers 1.5–1.6 mm long, oblong . . . . . *A. scheryi* Lundell
22b. Calyx lobes 1–2.3 × 1–2.2 mm; corolla lobes 4.3–7.1 × 1.9–2.7 mm; anthers 2.8–4.8 mm long, lanceolate.

23a. Leaf blades apically obtuse to subacuminate; calyx lobes 1.7–2.3 × 1.7–2.2 mm; styles 6.8–8.8 mm long . . . . . *A. maxonii* Standley
23b. Leaf blades apically acute to acuminate; calyx lobes 1–1.5 × 1–1.3 mm; styles 4.8–5.9 mm long.
24a. Calyx lobes 1.4–1.5 mm; corolla lobes 2.4–2.5 mm long; anthers 2.8–3 mm long; style 4.8–4.9 mm long; petioles 0.3–0.8 cm long . . . . *A. storkii* Lundell
24b. Calyx lobes 1–1.4 mm long; corolla lobes 3.4–4 mm long; anthers 3.4–4 mm long; style 5.4–5.9 mm long; petioles 0.6–1.6 cm long . . . . . *A. compressa* Kunth
21b. Leaf blades subcoriaceous to coriaceous.
25a. Leaf blades decurrent to petiole base and on branchlets, the branchlets with prominent interpetiolar ridges.
26a. Flowers 4-merous; calyx lobes 1–1.2 × 0.6–0.7 mm; corolla lobes 3–3.2 mm long; anthers 0.5–0.6 mm wide; styles 3.6–3.7 mm long . . . . . *A. nana* Pipoly & Ricketson
26b. Flowers 5-merous; calyx lobes 1.2–2.9 × 1.1–2 mm; corolla lobes 4.5–6.5 mm long; anthers 0.9–1.2 mm wide; styles 5–6.9 mm long.
27a. Branchlets and inflorescence rachis glabrous; petioles absent or to 0.5 cm long, slender; calyx lobes 2.5–2.9 × 1.5–2 mm; corolla lobes 2.3–2.5 mm wide; styles 6.3–6.9 mm long . . . . . *A. subsessilifolia* Lundell
27b. Branchlets and inflorescence rachis with scattered, minute furfuraceous-lepidote indument at least apically, usually glabrescent with age; petioles absent or to 2.2 cm long, stout; calyx lobes 1.2–2.2 × 1.1–1.5 mm; corolla lobes 1.5–2.2 mm wide; styles 5–6.1 mm long . . . . . *A. copeyana* Standley
25b. Leaf blades decurrent only to petiole base; branchlets without interpetiolar ridges.
28a. Branchlets terete.
29a. Calyx lobes 1.3–1.5 mm long; corolla lobes 1.6–1.8 mm wide; anthers 0.8–0.9 mm wide; styles 5.8–6.1 mm long . . . . . *A. rigidifolia* Lundell
29b. Calyx lobes 1.1–1.3 mm long; corolla lobes 1.9–2.1 mm wide; anthers 1–1.1 mm wide; styles 4.3–4.5 mm long . . . . . *A. jefeana* Lundell
28b. Branchlets angulate.
30a. Anthers 2–2.2 × 0.7–0.8 mm; stamens 3.8–4 mm long; pedicels 3–4.5 mm long; inflorescences 4–7 cm long; leaf blades short-acuminate, inconspicuously punctate and punctate-lineate . . . . . *A. guancheana* Lundell
30b. Anthers 2.3–4.4 × 0.8–1.2 mm; stamens 4.1–7.3 mm long; pedicels 5–8 mm long; inflorescences 9–14 cm long; leaf blades short-acute to -acuminate, conspicuously and prominently punctate and punctate-lineate . . . . . *A. costaricensis* Lundell

1. Ardisia nana Pipoly & Ricketson, sp. nov. TYPE: Panama. Panamá: Cabecera del Río Piriadi, 09°11′05″N, 078°16′00″W, 100–150 m, 13 June 1994 (fl), *H. Herrera 1627* (holotype, MO; isotypes, F, FTG, MO, PMA not seen, STRI not seen). Figure 2.

Haec species ob petiolos ad ramulos decurrentes, ramulos inter petiolos-porcatos, laminas foliares subcoriaceas vel coriaceas *A. subsessilifoliae* et *A. copeyanae* arcte affinis, sed ab eis floribus 4- (non 5-) meris, lobulis calycinis 1.0–1.2 × 0.6–0.7 (non 1.2–2.9 × 1.1–2.0) mm longis, lobulis corollinis 3.0–3.2 (non 4.5–6.5) mm longis, antheris 0.5–0.6 (non 0.9–1.2) mm latis, denique stylis 3.6–3.7 (non 5.0–5.9) mm longis statim separabilis.

Shrubs to 1 m tall. *Branchlets* slender, angulate, 2–4 mm diam., densely and minutely furfuraceous-lepidote at least apically, usually glabrescent with age, with prominent interpetiolar ridges. *Leaves* with blades subcoriaceous, elliptic or oblong to oblanceolate, 3–10.1 × 0.9–2.1 cm, apically acute to acuminate, the acumen 8–12 mm long, basally acute to cuneate, decurrent on the petiole and continuous with the interpetiolar ridges, inconspicuously punctate and punctate-lineate, glabrous above, with scattered, minute furfuraceous-lepidote indument below, glabrous along the midrib, the secondary veins 16 to 24 pairs, the margins entire, flat; petioles slender, marginate, 0.3–0.5 cm long, glabrous. *Inflorescence* terminal, erect, bipinnately to tripinnately paniculate, 4–5 × 3–3.5 cm, pyramidal, shorter than the leaves, densely and minutely furfuraceous-lepidote, the branches loosely congested into 3- to 9-flowered corymbs; peduncles 2–5 mm long; inflorescence branch bracts caducous, membranous, ovate to oblong, 1.5–2 × 0.6–0.9 mm, apically acute, prominently punctate and punctate-lineate, glabrous, the margins minutely erose, hyaline; floral bracts similar to the inflorescence branch bracts but ovate, 0.6–0.8 × 0.4–0.5 mm; pedicels slender, terete, 4–5 mm long, prominently punctate and punctate-lineate, glabrous. *Flowers* 4-merous; calyx 1.3–1.5 mm long, the tube 0.2–0.3 mm long, the lobes ovate, 1–1.2 × 0.6–0.7 mm, apically acute to rounded, conspicuously and

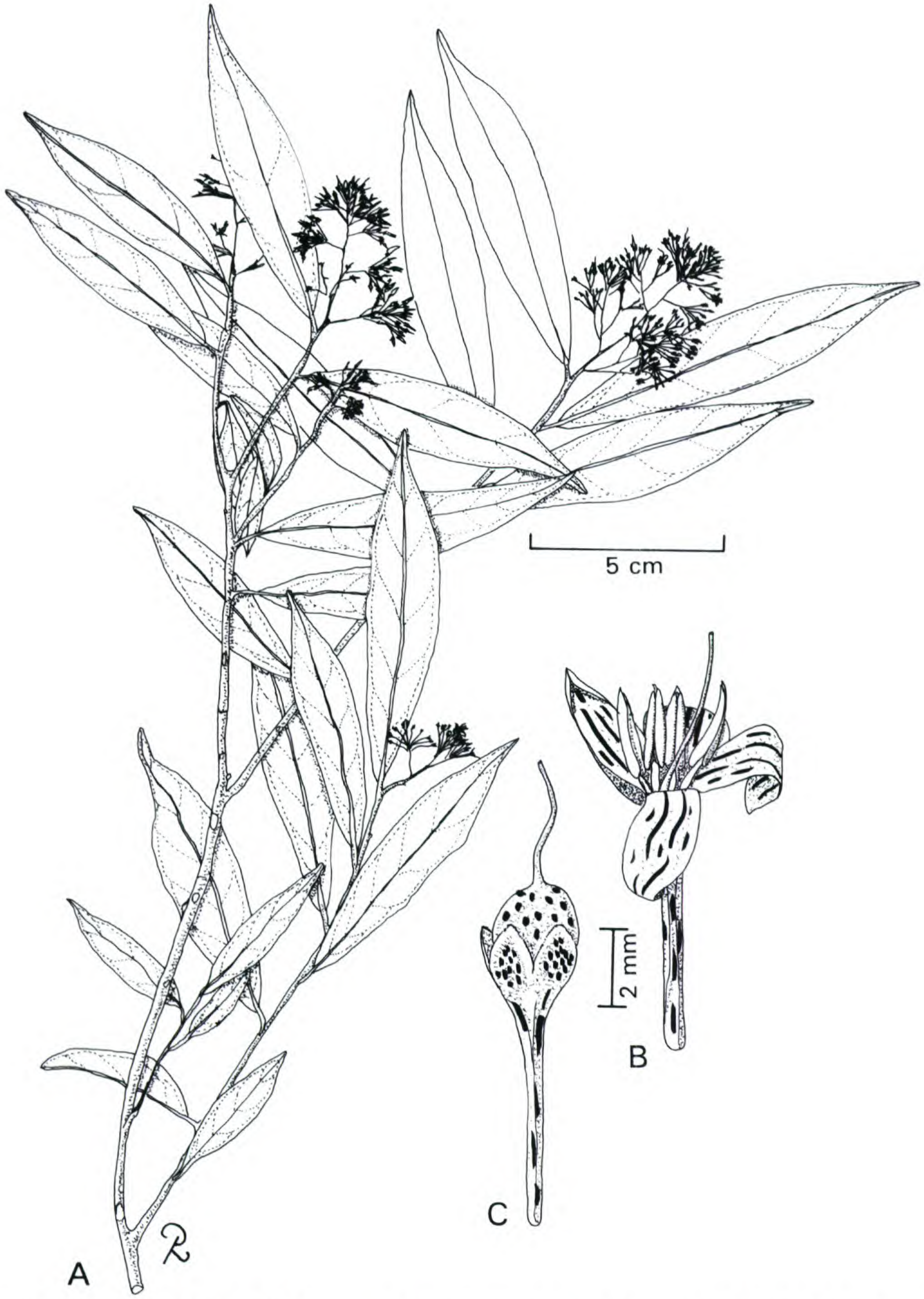

Figure 2. *Ardisia nana* Pipoly & Ricketson. —A. Flowering branch. —B. Flower. —C. Fruit. A–C drawn from the holotype, *H. Herrera 1627* (MO).

prominently punctate and punctate-lineate, glabrous, the margins minutely erose, hyaline; corolla white, 4.2–4.3 mm long, the tube 1–1.2 mm long, the lobes lanceolate, 3–3.2 × 1.5–1.7 mm, apically acute, prominently punctate and punctate-lineate, glabrous, the margins entire; stamens 3.5–3.7 mm long, the filaments 1.7–1.8 mm long, the staminal tube 0.3–0.5 mm long, the apically free portion

1.2–1.5 mm long, epunctate, glabrous, the anthers free, lanceolate, 2.1–2.2 × 0.5–0.6 mm, apically apiculate, basally subcordate, the connective inconspicuously punctate; pistil 4.4–4.6 mm long, glabrous, the ovary ovoid, 0.6–0.7 mm long, the style 3.6–3.7 mm long, epunctate, the ovules 7 to 9. *Fruits* unknown.

Distribution. *Ardisia nana* is endemic to the Río Piriadi area in the province of Panamá, Panama, from 100 to 150 m elevation.

Ecology and conservation assessment. This species occurs in the unnamed valley that forms the drainage basin of Lago Bayamo and Río Chepo. It houses tropical wet forest facing the Pacific, where the Chocó Floristic Province of Panama, Colombia, and Ecuador has its northernmost extension. The valley is just east of where the Pan American Highway ends, so threats to the area owing to timber harvest and settlement are much less than they are farther westward. The species' extent of occurrence, based on availability of suitable habitat, is approximately 4150 km^2, and the known area of occupancy is less than 1 km^2. Therefore, we regard this species as Endangered, ENB1aD, sensu the IUCN Red List criteria (IUCN, 2001). The Endangered status was determined based on the fact that the (B1) extent of occurrence is less than 5000 km^2, (a) known from less than five locations, and (D) the population size is estimated at fewer than 250 individuals. It is significant that the type collection was gathered from one of the most heavily collected areas of Panama, so we can be relatively certain that it is at least a rare species in terms of number of individuals per hectare.

Etymology. The epithet comes from the Latin word "nana," meaning dwarf, referring to the small leaves and flowers.

The decurrent leaf bases running to interpetiolar ridges, and subcoriaceous to coriaceous leaf blades indicate that *Ardisia nana* is close to *A. subsessilifolia* and *A. copeyana*. However, *A. nana* is immediately separable from the latter two species by the 4-merous flowers, shorter and narrower calyx lobes, smaller corolla lobes, and smaller anthers and style.

2. Ardisia pseudocuspidata Pipoly & Ricketson, sp. nov. TYPE: Panama. Darién: SW ridge leading to Alturas de Nique on the Colombian border, 900 m, 28 Dec. 1980 (fl), *R. Hartman 12363* (holotype, MO; isotypes, LL, PMA not seen). Figure 3.

Haec species propter rhachides inflorescentiarum angulatas et longitudinaliter interamulari-porcatas, laminam foliarem membranaceam (non chartaceam), ad basim obtusam vel rotundatam (nec cuneatam), necnon lobulos calycinos 1–1.3 × 0.9–1.1 (non 1.3–1.5 × 1.1–1.3) mm *A. cuspidatae* valde arcte affinis, sed ab ea lobulis corollinis 3.2–3.5 × 1.7–1.9 (non 2.3–2.6 × 1.1–1.4) mm, antheris 1.8–2.0 × 0.7–0.9 (non 1.4–1.6 × 0.5–0.7) mm, stylis 2.9–3.2 (non 3.5–3.8) mm longis, fructibus 5.0–6.0 (non 3.5–4.5) mm diametris, praeclare distat.

Small trees 3–4 m tall, to 9 cm diam. *Branchlets* slender, sharply angulate, 1–4 mm diam., densely and minutely furfuraceous-lepidote at least apically, usually glabrescent with age. *Leaves* with blades membranous, ovate to elliptic, 4.3–8.7 × 1.8–3.7 cm, apically cuspidate, the acumen 7–14 mm long, basally obtuse to rounded, decurrent to petiole base, but not onto stem, prominently punctate and punctate-lineate, glabrous above, with scattered minute furfuraceous-lepidote indument below, the secondary veins 28 to 35 pairs, obscure to prominulous above and below, the margins entire, flat; petioles slender, marginate, 3–5 mm long, glabrous above, densely and minutely furfuraceous-lepidote below. *Inflorescences* lateral and terminal, erect, pinnately to bipinnately paniculate, 3–5 × 3–4.5 cm, pyramidal, shorter than the leaves, densely and minutely furfuraceous-lepidote, the branches loosely congested into 3- to 7-flowered corymbs; peduncles 0.3–0.6 cm long; inflorescence branch bracts unknown, early caducous; floral bracts caducous, membranous, ovate, 0.6–1 × 0.4–0.8 mm, apically acute, conspicuously and prominently punctate and punctate-lineate, glabrous within, with scattered minute furfuraceous-lepidote indument without, the margins minutely erose, hyaline; pedicels slender, terete, 2.9–4.1 mm long, prominently punctate and punctate-lineate, densely and minutely furfuraceous-lepidote. *Flowers* 5-merous; calyx 1.6–1.8 mm long, the tube 0.4–0.6 mm long, the lobes ovate, 1–1.2 × 0.9–1.1 mm, apically acute, conspicuously and prominently punctate and punctate-lineate, glabrous within, with scattered minute furfuraceous-lepidote indument without, the margins minutely erose, hyaline; corolla white, membranous, 4.4–4.7 mm long, the tube 1–1.2 mm long, the lobes lanceolate 3.2–3.5 × 1.7–1.9 mm, apically acute, prominently punctate and punctate-lineate, glabrous, the margins entire; stamens 3.4–3.7 mm long, the filaments 2–2.2 mm long, the staminal tube 0.7–0.9 mm long, the apically free portion 1.1–1.3 mm long, prominently punctate and punctate-lineate, glabrous, the anthers free, oblong to lanceolate, 1.8–2 × 0.7–0.9 mm, apically apiculate, basally cordate, the connective inconspicuously punctate and punctate-lineate; pistil 4.1–4.5 mm long, glabrous, the ovary ovoid, 0.7–0.9 mm long, the style 3.5–3.8 mm long, inconspicuously

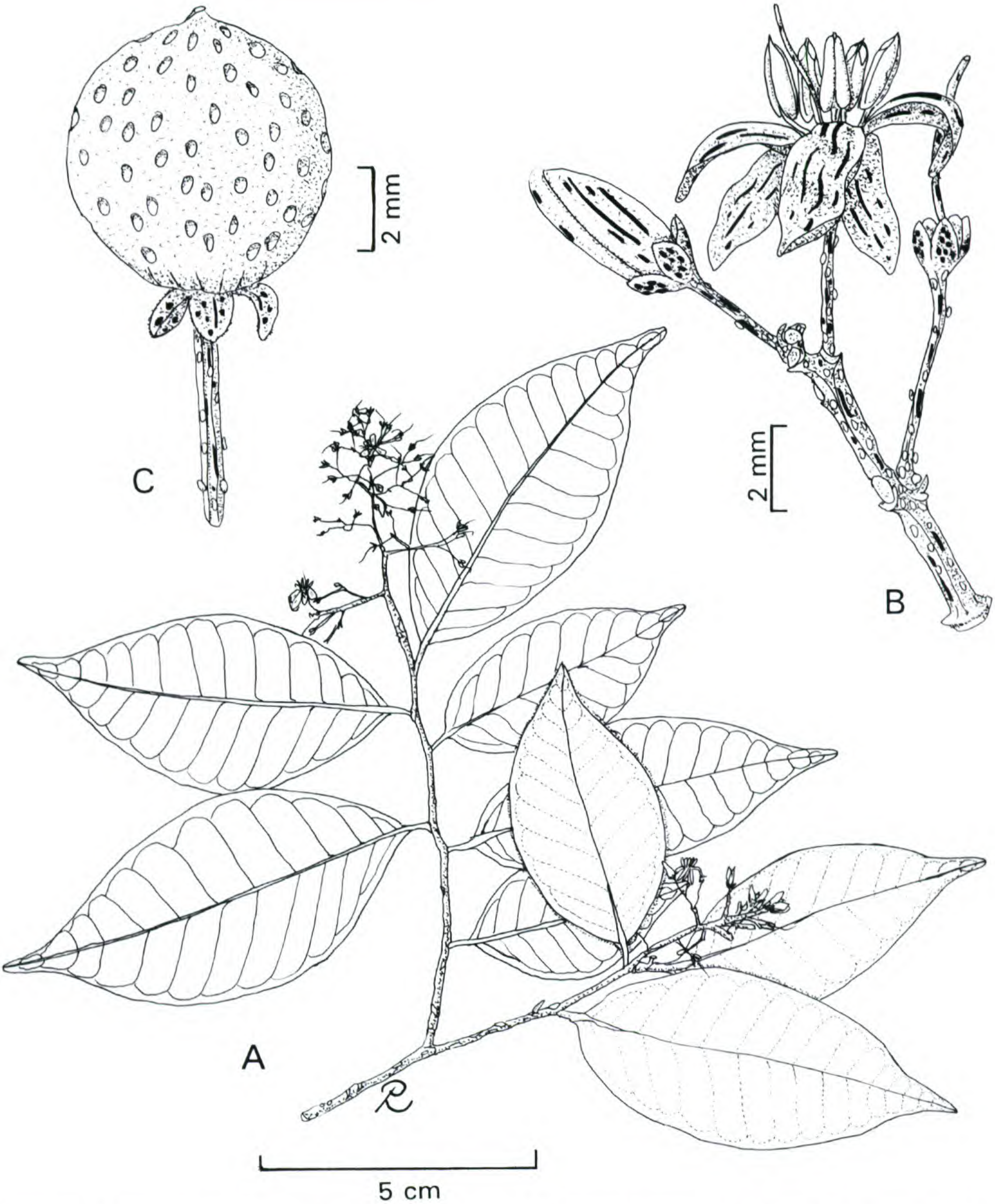

Figure 3. *Ardisia pseudocuspidata* Pipoly & Ricketson. —A. Flowering branch. —B. Detail of inflorescence. —C. Fruit. A & B drawn from the holotype, *R. Hartman 12363* (MO): C from *A. Gentry & A. Clewell 7082* (MO).

punctate and punctate-lineate, the ovules 38 to 47. *Fruits* globose, 5–6 mm diam., prominently punctate and punctate-lineate, glabrous.

Distribution. *Ardisia pseudocuspidata* is endemic to the province of Darién, Panama (belonging to the Chocó Floristic Province), near the Colombian border, from 800 to 1400 m elevation.

Ecology and conservation assessment. This species occurs along ridges in cloud and elfin forests. The high-altitude areas on the Panamanian-Colombian border are remote and might be safe from imminent destruction owing to civil unrest. The area lies within Darién National Park and has Katios National Park adjoining it on the Colombian

side, both of which afford further protection. The species is restricted to that portion of the Serranía del Darién that comprises Cerro Pirré and Nique, a mountain chain running from southwest to northeast and forming the border between Panama and Colombia. Therefore, we estimate the possible extent of occurrence for the species to be approximately 500 km^2 and the area of occupancy certainly less than that. Using the IUCN (2001) Red List Criteria, *Ardisia pseudocuspidata* is Endangered, EN B2aD, because the area of occupancy is estimated to be less than 500 km^2 (B2), the species is known from less than five locations (a), and the population size is estimated to be less than 250 mature individuals (D).

Etymology. The specific epithet refers to its similarity to *Ardisia cuspidata.*

Paratypes. PANAMA. **Darién:** Cerro Campamento, S of Cerro Pirré, 20–22 Mar. 1968 (fr), *J. Duke 15676* (MO, PMA not seen); summit of Cerro Pirré, 29 Dec. 1972 (fr), *A. Gentry & A. Clewell 7082* (LL, MO, PMA not seen).

Owing to its angulate inflorescence rachises and sharply angulate branchlets, membranous leaf blades obtuse to rounded basally, and calyx lobes from 1–1.3 × 0.9–1.1 mm, *Ardisia pseudocuspidata* is closely related to *A. cuspidata.* However, *Ardisia pseudocuspidata* is clearly separated from *A. cuspidata* by its large corolla lobes 3.2–3.5 × 1.7–1.9 (not 2.3–2.6 × 1.1–1.4) mm, larger anthers 1.8–2.0 × 0.7–0.9 (not 1.4–1.6 × 0.5–0.7) mm, longer styles 3.5–3.8 (not 2.9–3.2) mm long, and larger fruits 5.0–6.0 (not 3.5–4.5) mm in diameter.

Taxonomic revision of *Ardisia* subg. *Icacorea* also disclosed the necessity of making the following two combinations, syonymizations and typification.

3a. Ardisia furfuracella Standley subsp. **furfuracella,** Ann. Missouri Bot. Gard. 25: 832. 1938. TYPE: Panama. Chiriquí: valley of upper Río Chiriquí Viejo, 1300–1900 m, (fl), *P. & G. White 8* (holotype, F; isotypes A, LL neg. 1971-49, MO).

Distribution. *Ardisia furfuracella* subsp. *furfuracella* occurs throughout the Cordillera de Talamanca in the provinces of Cartago and Puntarenas, Costa Rica, to the province of Chiriquí, Panama, from 1300 to 2200 m elevation.

Ecology and conservation assessment. Subspecies *furfuracella* has an extent of occurrence nearing 24,000 km^2 and an area of occupancy of approximately 12,000 km^2. The species is known to be locally common, but the populations are very fragmented as this subspecies specializes in the transition zone from montane wet forest to cloud forest habitats. That transition zone is the upper limit for coffee cultivation and a number of other products, and therefore, the disturbance noted by Pipoly (*Pipoly 7603*) is likely to increase. We therefore consider this species to be Vulnerable, VUC1,C2ai, where we note that (C1) the population sizes are estimated to number fewer than 10,000 mature individuals and (C2) a continuing decline is inferred in numbers of mature individuals and (a) population structure is in the form of (i) no subpopulation estimated to contain more than 1000 mature individuals.

3b. Ardisia furfuracella Standley subsp. **veraguasensis** (Lundell) Pipoly & Ricketson, comb. et stat. nov. Basionym: *Ardisia veraguasensis* Lundell, Wrightia 5: 64. 1974. *Icacorea veraguasensis* (Lundell) Lundell, Phytologia 49: 352. 1981. TYPE: Panama. Veraguas: Caribbean slope above Río Primero Brazo, 5 mi. NW Santa Fe, 700–1200 m, 18–19 Mar. 1973 (fl), *R. Liesner 986* (holotype, LL; isotypes, GH, MO, PMA not seen).

Ardisia caudatifolia Lundell, Wrightia 5: 278. 1976. Syn. nov. *Icacorea caudatifolia* (Lundell) Lundell, Phytologia 49: 347. 1981. TYPE: Panama. Veraguas: along stream between Santa Fe & Escuela Agrícola Alto Piedras, without elev., 29 Aug. 1974 (fr), *T. Croat 27344* (holotype, LL, F neg. 55648; isotypes, MO, PMA not seen).

Ardisia oerstediana Lundell, Wrightia 6: 84. 1979. Syn. nov. *Icacorea oerstediana* (Lundell) Lundell, Phytologia 49: 350. 1981. TYPE: Panama. Veraguas: 0.6 mi. beyond Escuela Agrícola Alto Piedra, 730 m, 4 Apr. 1976 (fl), *T. Croat & J. Folsom 34055* (holotype, LL, F neg. 55678; isotypes, MO, PMA not seen).

Distribution. *Ardisia furfuracella* subsp. *veraguasensis* is known from Nicaragua southward to the province of Veraguas, Panama, from 100 to 1600 m elevation.

Ecology and conservation assessment. This subspecies occurs in open, windswept forest margins and has significant tolerance to drying and other disturbance. The extent of occurrence is 108,900 km^2, with an area of occupancy of nearly 12,100 km^2 and with 60 collections known from 27 populations. There are no data regarding number of individuals per population, but all of the environments mentioned were disturbed ones. Therefore we must assume that the plant is rather resilient, and we would therefore classify it as of least concern, LC.

Ardisia furfuracella subsp. *veraguasensis* may be separated from subspecies *furfuracella* by its membranous (not chartaceous) leaf blades that are essentially glabrous below, except with scattered to

densely and minutely furfuraceous-lepidote scales along the midrib (not scattered furfuraceous-lepidote across the leaf below), the glabrous (not lepidote) pedicels, the larger calyx lobes 1.4–1.6 × 1.1–1.3 (not 0.9–1.2 × 0.5–1) mm, with larger corolla lobes 4.4–4.6 × 1.7–2.1 (not 2.9–3.2 × 1.6–1.8) mm, larger anthers 2.2–3.1 (not 1.6–1.9) mm long, and longer style 4.7–5.3 (not 3.6–3.9) mm long.

The type of *Ardisia caudatifolia* is qualitatively identical to the type of *A. veraguasensis*, differing only in its longer leaves and inflorescences. Likewise, the type of *A. oerstediana* is notable only for its large membranous leaf blades that are extremely bullate, and the inflorescences that are larger and much wider than those of the type of *A. veraguasensis*. In all other aspects the two are identical. The variation seen in the types of *Ardisia caudatifolia* as well as that observed in *A. oerstediana* fall well within the range seen across the species. We therefore see no support for their separation as species, and have thus placed *Ardisia veraguasensis* and *A. oerstediana* in synonymy with *A. furfuracella* subsp. *caudatifolia*.

We recognize *Ardisia furfuracella* subsp. *veraguasensis* as distinct from subspecies *furfuracella* based on its leaf blades, which are membranous (not chartaceous), essentially glabrous below, except sparsely to densely and minutely furfuraceous-lepidote along the midrib (not sparsely and minutely furfuraceous-lepidote below, the scales denser along the midrib), pedicels glabrous (not with scattered, minute furfuraceous-lepidote indument), calyx lobes 1.4–1.6 × 1–1.3 (not 0.9–1.2 × 0.5–1) mm; corolla lobes 4.4–4.6 × 1.7–2.1 (not 2.9–3.2 × 1.6–1.8) mm; anthers 2.2–3.1 (not 1.6–1.9) mm long; and styles 4.7–5.3 (not 3.6–3.9) mm long.

During our studies of a group of entities related to *Ardisia mexicana*, the need to lectotypify its synonym, *Ardisia compressa* var. *mexicana*, became apparent, and is accomplished herewith.

4a. Ardisia mexicana Lundell subsp. **mexicana,** Wrightia 3: 77. 1963. *Gentlea mexicana* (Lundell) Lundell, Wrightia 5: 44. 1974. TYPE: Mexico. Jalisco: crest of ridge facing the Pacific, 10 mi. S of Autlán, ca. 5700 ft. [1737 m], 20 Aug. 1949 (fl), *R. Wilbur & C. Wilbur 2460* (holotype, LL; isotype, MICH).

Ardisia compressa Kunth var. *mexicana* Oersted, Vidensk. Meddel. Dansk Naturhist. Føren. Kjøbenhavn 1861: 125. 1862. TYPE: Mexico. Oaxaca: Prope Quatulco, without elev., Oct. 1842 (fl), *F. Liebmann 21* (lectotype, designated here, C).

Icacorea jaliscensis Lundell, Phytologia 53: 412. 1983. Syn. nov. *Ardisia jaliscensis* (Lundell) Lundell, Phytologia 61: 65. 1986, nom. inval. *Ardisia jaliscensis* (Lundell) Pipoly & Ricketson, Sida 18: 513. 1998. TYPE: Mexico. Jalisco: along road to Jirosto, ca. 10 km WNW of Purificación, ca. 19°44′N, 104°42′W, 400 m, 11 Jan. 1979 (fr), *H. Iltis & M. Nee 1437* (holotype, LL-TEX; isotype, MEXU 2 sheets, US, WIS not seen).

In A. Oersted's (1862: 125) original description of *Ardisia compressa* var. *mexicana*, three collections were cited: "Cl. Liebmann hanc varietateum prope Quatulco et Mirador a mense Octobris in januarium usque florentem et juxta Colipa Martio fructificantem legit." Without a clear indication of a holotype, a lectotype must be selected. Unfortunately, the specimen from Quatulco is the only remaining Liebmann collection of this species at C where the Oersted types are housed. The Missouri Botanical Garden houses a duplicate of the Colipa collection, and no collection from Mirador can be located. Thus we hereby designate the *F. Liebmann 21* collection from Quatulco at C as the lectotype.

Distribution. *Ardisia mexicana* subsp. *mexicana* is restricted to the foothills of the Sierra Madre del Sur mountain range in the broad sense, from the state of Nayarit in the north to Oaxaca in the south, and in the foothills of the mountains of Veracruz, from 100 to 300 m elevation.

Ecology and conservation assessment. The extent of occurrence for this subspecies is approximately 48,000 km², with an area of occupancy of less than 1000 km², and collections made from only 15 locations. Label data from herbarium specimens indicate that the plant is rare in these localities, often at the lower margin of pine-oak forests, where access roads typically occur. We classify this species as Vulnerable, VU B2 bii, biii, biv, where B2 indicates that the area of occupancy is estimated to be less than 2000 km², and there is a continuing decline observed and projected in the (bii) area of occupancy, (biii) quality of habitat, and (biv) number of locations or subpopulations. The populations from Nayarit have not been observed since 1957, and new collections coming to us from floristic projects in Mexico have not included any new material.

4b. Ardisia mexicana Lundell subsp. **siltepecana** (Lundell) Pipoly & Ricketson, comb. et stat. nov. Basionym: *Ardisia siltepecana* Lundell, Wrightia 4: 66. 1968. *Icacorea siltepecana* (Lundell) Lundell, Phytologia 49: 351. 1981. TYPE: Mexico. Chiapas: Cascada near Siltepec, 1600 m, 1 Mar. 1945 (fl), *E. Matuda 5161* (holotype, LL; isotypes, F, LL 2 sheets, MEXU).

Distribution. This subspecies is endemic to the southern portion of Chiapas, Mexico, from 200 to 1600 m elevation.

Ecology and conservation assessment. *Ardisia mexicana* subsp. *siltepecana* occurs along river banks in dry forests. Using the IUCN (2001) criteria we consider it endangered because its extent of occurrence is less than 5000 km^2, it is known from fewer than five gatherings at separate locations, the area of occupancy is less than 500 km^2, and the population size is estimated to number less than 2500 mature individuals, ENB1a, 2a.

This subspecies differs from *Ardisia mexicana* subsp. *mexicana* by its chartaceous (not membranous) leaf blades with scattered furfuraceous-lepidote scales over the entire surface (not restricted to the veins), the smaller calyx lobes 0.9–1.2 × 0.5–1 (not 1.4–1.6 × 1–1.3) mm, the smaller corolla lobes 2.9–3.2 × 1.6–1.8 (not 4.4–4.6 × 1.7–2.1) mm, the smaller anthers 1.6–1.9 (not 2.2–3.1) mm long, and the shorter styles 3.6–3.9 (not 4.7–5.3) mm long. Subspecies *siltepecana* is also restricted to dry forests instead of the humid habitats of subspecies *mexicana*.

Acknowledgments. We are grateful to the Missouri Botanical Garden (MO), to Gerrit Davidse (MO) as well as the *Flora Mesoamericana* Project, and the Fairchild Tropical Garden for their support of this inter-institutional research effort. Many thanks are due to Roy Gereau (MO) for reviewing the Latin diagnoses. The drawings were prepared by Jon Ricketson.

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New Species of *Siparuna* (Siparunaceae) IV. A New Subcanopy Tree from White-Sand Areas in Brazil and Venezuela

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ABSTRACT. A new species of *Siparuna* (Siparunaceae), *S. ficoides*, is described, illustrated, and placed in a phylogenetic context based on morphological and DNA sequence data. The species, which is a monoecious subcanopy tree, is known from three collections made near Manaus, Brazil (two from the same tree), and one in the state of Bolívar, Venezuela.

RESUMEN. Se describe y se ilustra una nueva especie de *Siparuna* (Siparunaceae), *S. ficoides*, además se la ubica en un contexto filogenético basado en datos morfológicos y en sequencias de DNA. Esta nueva especie es un árbol monoico de subdosel, de la cual se han registrado tres colecciones cerca de Manaos, Brasil (dos del mismo árbol) y una colección en el Estado de Bolívar, Venezuela.

Key words: Brazil, Central Amazon basin, forest on sandy soils, *Siparuna*, Siparunaceae, Venezuela.

The Ducke Forest Reserve comprises some 10,000 ha of non-flooded forest on the outskirts of Manaus, capital of the state of Amazonas, Brazil. Between 1955 and 1978, about 7000 collections of vascular plants were made there, and another 7354 were added between 1992 and 1998, as part of a British-Brazilian technical cooperation that resulted in a "Field Guide to the Vascular Plants" (Ribeiro et al., 1999; M. Hopkins, pers. comm., May 2004). This collection density makes the Ducke forest the best-documented site in the Amazon basin, at least with regard to vascular plants. It is all the more remarkable that new species of trees continue to come to light among collections made in the reserve during the 1990s that are now available for study, mainly in the herbaria INPA, K, MG, NY, RB, and SP. One such species is described here, based on collections from the Ducke reserve and from the Venezuelan state of Bolívar. This distributional range makes sense phytogeographically because the Ducke area harbors many species adapted to sandy soils, such as are typical of the Rio Negro basin and the Venezuelan Gran Savanna.

Siparunaceae consist of just two genera, *Siparuna* Aublet (including *Bracteanthus* Ducke) and its sister group *Glossocalyx* Bentham, a monotypic West African genus very similar to *Siparuna* (Renner, 2004; Renner & Hausner, 2005). Most of the 53 species of *Siparuna* are dioecious, but the phylogenetically basal species (in a molecular phylogeny; Renner & Won, 2001) are monoecious and include the large tree species as well as most lowland species found in the genus. Besides monoecy, they share entire-margined leaves, fruitlets that lack stylar arils, and little-developed tepals. ("Stylar aril" is a term introduced by Corner [1976] for the fleshy appendages present on some Siparunaceae fruitlets; others, for example, Endress [1980] and Barroso [1999], have referred to these appendages as superarils because they do not derive from the seed or funiculus like a true aril [van der Pijl, 1982: 139, fig. 25]. Instead, the appendages in *Siparuna* develop as asymmetric outgrowths at the style base. The stylar arils in *Siparuna* are orange or red in color and rich in oil, but contain little or no starch. As far as known, monoecious species lack stylar arils, and their drupelets' exo- and mesocarp instead often becomes slimy.) The new species described here has been sequenced for one chloroplast locus and one nuclear locus (Renner & Won, 2001, under the name *S.* aff. *monogyna*), and based on these data it belongs in a clade that also includes *S. cristata* (Poeppig & Endlicher) A. DC., the species to which it is most similar morphologically (see below).

Siparuna ficoides Renner & Hausner, sp. nov. TYPE: Brazil. Amazonas: Res. Flor. Ducke, Manaus–Itacoatiara, km 26, 02°53′S, 59°58′W, permanently tagged tree 3325-74, 29 Sep. 1995, *C. A. Sothers, E. da C. Pereira & C. F. da Silva 591* (holotype, INPA; isotypes, K, MG, MO, NY, R, SP, U). Figures 1, 2.

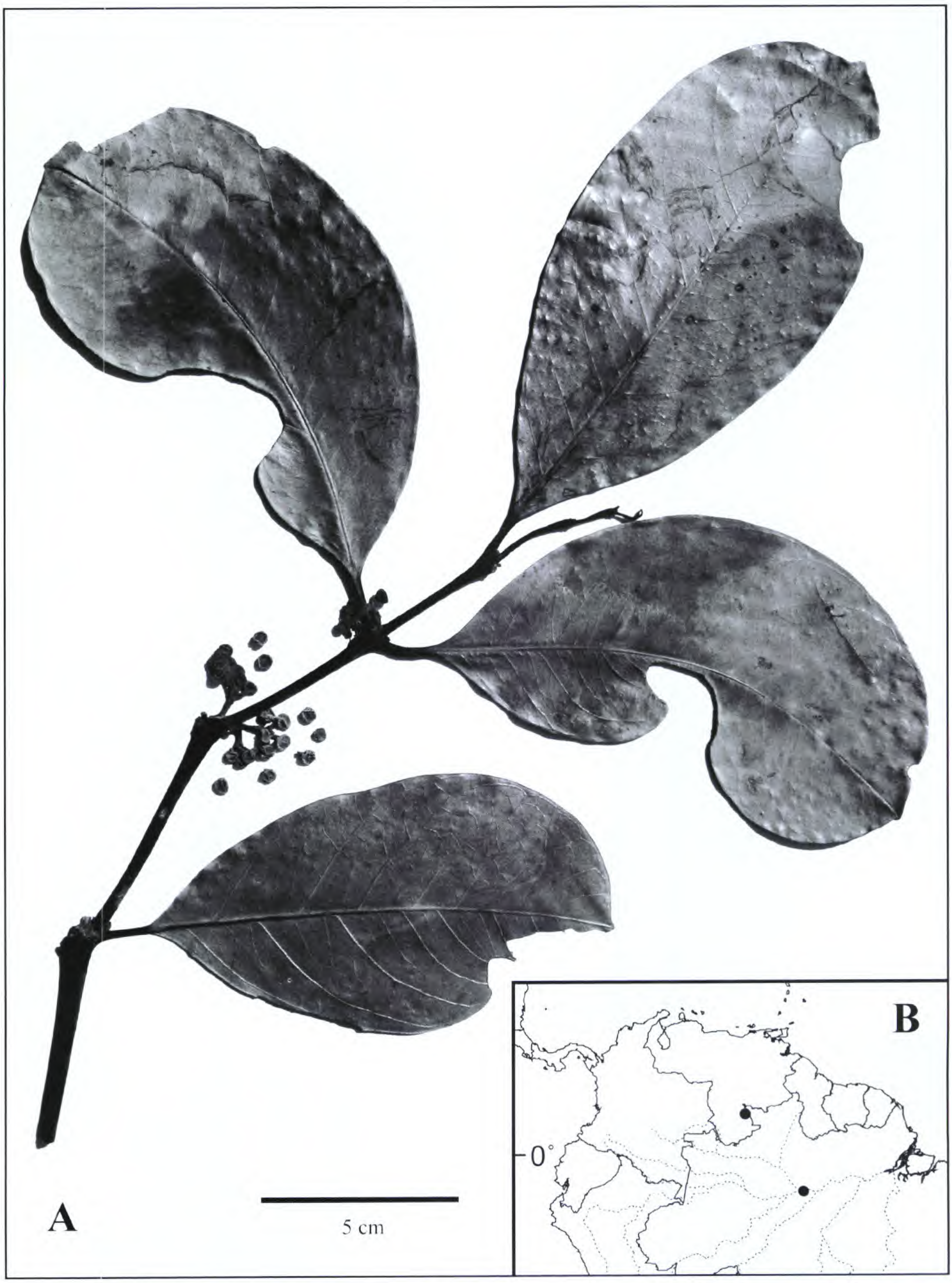
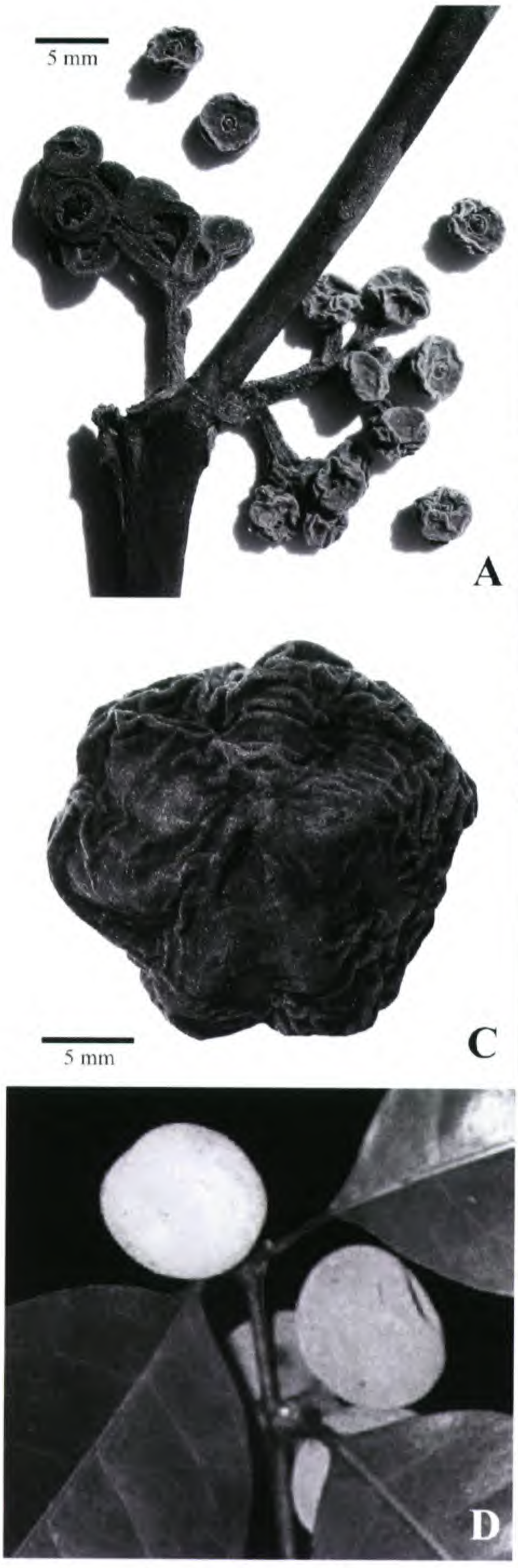


Figure 1. —A. Habit of *Siparuna ficoides* Renner & Hausner (*Sothers et al. 591*, MO, isotype). —B. Distribution of *S. ficoides*.



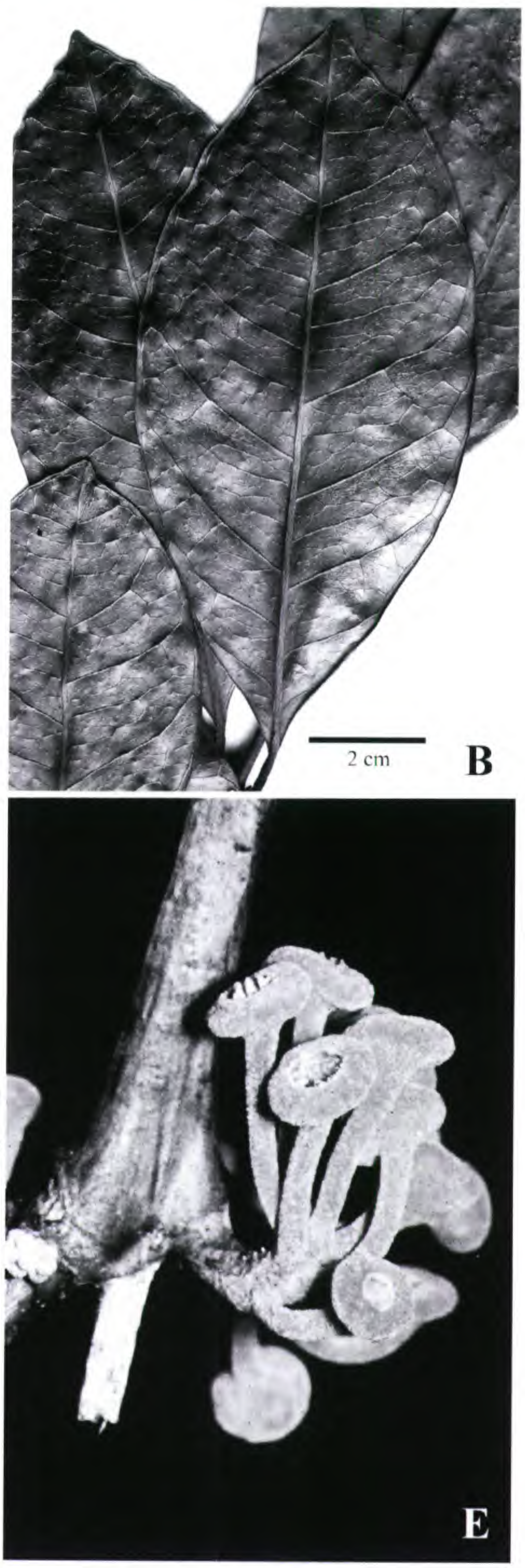


Figure 2. *Siparuna ficoides* Renner & Hausner. —A. Inflorescences with male (left) and female flowers (right, some broken off); (*Sothers et al. 591*, MO, isotype). —B. Lower leaf surface, showing the loose tertiary venation (*Briceño 427*, NY, paratype). —C. Fruiting receptacle (*Assunção et al. 808*, NY, paratype). —D. Branchlet with young fruiting receptacles (Reserva Florestal Ducke, tree 3133-74; vouchers from this tree are *Assunçao et al. 808* and *Vicentini et al. 1010*). —E. Inflorescence with male flowers (Reserva Florestal Ducke, tree 3325-74; a voucher from this tree includes the isotype *Sothers et al. 591*, MO). Photos D and E: M. J. G. Hopkins.

A *Siparuna cristata* foliis brevioribus et angustioribus (9–15 × 4–8.8 cm) cum venis tertiaris irregulariter anastomosantibus laxe dispersis fructibus subglobosus (ca. 2 × 1.1 cm) pilosibusque differt.

Monoecious *subcanopy tree*, 13–20 m tall, with a DBH of 10–11 cm, the trunk straight, the slash wound light tan or yellowish and strongly lemon-scented; young branchlets terete or flattened at the nodes, glabrous. *Leaves* opposite; petioles 1–2.2 cm long; lamina drying light green, yellowish or grayish green, shiny, stiff-chartaceous to coriaceous, obovate or elliptic, 9–15 × 4.4–8.8 cm, the base obtuse and shortly attenuate, the apex obtuse, acuminate, truncate, or emarginate, mature leaves glabrous except for very few peltate or stellate-lepidote hairs on the lower leaf surface or on the midrib; with 9 to 12 pairs of secondary veins, these flat above, slightly raised below, anastomosing near the leaf margin, the tertiary veins irregularly reticulate and loosely spaced (Fig. 2B), the margin entire. *Cymes* in the axils of extant leaves or on leafless nodes, about 1.5 cm long, with 6 to 12 flowers, the peduncle 4–6 mm long, the pedicels of male flowers gradually elongating during anthesis and becoming up to 8 mm long, those of the female flowers and fruiting receptacles remaining short (Figs. 1, 2); cymes persistently velvety. Fresh *flowers* green with a cream-colored center, dried golden-brownish in color; *male flowers* cup-shaped, 3–3.5 mm high, 4–4.5 mm diam., the indumentum as on the cymes, the tepals reduced to a circular rim surrounding the flower center with its barely developed tomentose floral roof (Fig. 2A, E), stamens 27 to 30, fleshy and with small anther flaps, dorsally with a few stellate hairs; *female flowers* subglobose, 2.5–3.5 mm high, 4–5 mm diam., the tepals reduced to a circular rim around the flower center (Fig. 2A); the floral roof conical and velvety; carpels ca. 8, the styles basally fused to a short column and hardly protruding from the floral roof, the free parts of the styles thin and easily detached. *Fruiting receptacle* subglobose, ca. 1.1 cm in height and 2 cm diam. (Fig. 2C), when fresh greenish yellow and densely pubescent (Fig. 2D), dried material persistently velvety brown-pubescent, the drupelets protruding (Fig. 2C), drupelets about 6, apparently lacking a stylar aril.

Distribution (Fig. 1B), *habitat, and phenology.* *Siparuna ficoides* is known from the Central Amazon basin and the state of Bolívar in Venezuela, where it grows on sandy soils at altitudes up to about 410 m. Flowers and fruits have been collected in August and September.

Etymology. The species is named for its leaves resembling certain species of *Ficus* L. (Moraceae).

Common name. The Venezuelan Yekuana (or Yekuna) Indians refer to this species as Medebadi and apply the leaves against snakebites (*Briceño 427*).

Siparuna ficoides resembles *S. cristata*, which ranges throughout the Amazon basin and into northern Venezuela, adjacent northernmost Colombia, and Panama, and which also occurs in the Ducke reserve. The two species have similar glabrous leathery leaves, but *S. cristata* has glabrous fruits that are elongate in shape, reaching 3.5–4 cm in length, with a diameter of (1–)2–3.5 cm, whereas the fruits of *S. ficoides* are densely velvety pubescent and subglobose in shape. In addition, *S. cristata* usually has 10 to 18 stamens, while *S. ficoides* has 27 to 30 stamens, the leaves of *S. cristata* dry dark brown and their blades measure 18–27(–38) × (7–)9–14 cm, while leaves of *S. ficoides* dry light green or light brown and have blades measuring 9–15 × 4.4–8.8 cm. Yet another difference lies in the leaf venation: in *S. cristata*, the tertiary veins cross between adjacent secondaries in parallel paths without branching, while in *S. ficoides* they are irregularly anastomosing and loosely spaced (Fig. 2B) compared to other species of *Siparuna*. A few duplicates of *S. ficoides* were distributed as *S. monogyna* Jangoux, a name that we briefly thought might pertain to the new entity, but a study of the type of *S. monogyna* revealed that this name does not apply. Another monoecious species with velvety fruits is *S. gentryana* S. S. Renner, occurring in Ecuador and Colombia. However, *S. gentryana* has tuberculate fruits, rather than smooth, subglobose ones, and dark brown leaves with a venation more like *S. cristata*.

Paratypes. VENEZUELA. **Bolívar:** Foráneo Aripao, Botadero Norte, 8 May 1994, *E. Briceño 427* (NY). BRAZIL. **Amazonas:** Res. Flor. Ducke, Manaus–Itacoatiara, km 26, near observation tower, permanently tagged tree 3133-74, 5 Sep. 1995, *A. Vicentini, P. A. C. L. Assunção, C. F. da Silva & E. da C. Pereira 1010* (INPA, K, MG, MO, NY, R, RB, SP, U), same tree collected again, 6 Mar. 1998, *P. A. C. L. Assunção, E. da C. Pereira & C. F. da Silva 808* (INPA, K, MG, MO, NY, RB, SP, U, UB).

Acknowledgments. We thank Mike Hopkins (MG) and Cynthia Sothers (K) for photos of the new species, and the reviewers David Lorence and Juan Martínez-Laborde for their comments.

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A New, Red-Flowered Species of *Tripodanthus* (Loranthaceae) from Colombia

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ABSTRACT. A new species of *Tripodanthus*, *T. belmirensis* Roldán & Kuijt, is described and illustrated from Antioquia, Colombia. In contrast to the other two, more southern species of the genus, *T. acutifolius* (Ruiz & Pavón) Tieghem and *T. flagellaris* (Chamisso & Schlechtendal) Tieghem, it has bright red, much larger flowers. This is the first report of *Tripodanthus* from Colombia.

Key words: Colombia, Loranthaceae, *Tripodanthus*.

A remarkable red-flowered member of the mistletoe family Loranthaceae was collected some years ago in the area of Belmira, Colombia, and the present report documents the species as a member of the genus *Tripodanthus* (Eichler) Tieghem. Until this time, *Tripodanthus* has consisted of two white-flowered species, *T. flagellaris* (Chamisso & Schlechtendal) Tieghem (northern Argentina, adjacent Uruguay, and southern Brazil) and *T. acutifolius* (Ruiz & Pavón) Tieghem (northern Argentina, Uruguay, and southern Brazil to Venezuela; not yet known from Colombia).

Tripodanthus belmirensis Roldán & Kuijt, sp. nov. TYPE: Colombia. Antioquia: Belmira, Finca El Páramo, 3000–3130 m, 6°35′N, 75°32′W, 21 Apr. 1993, *R. Fonnegra & D. Tuberquia 4576* (holotype, HUA; isotype, LEA). Figures 1, 2.

Caulis subquadrangulus, folia opposita, lanceolata. Inflorescentia terminalis, paribus triadarum 5–8. Flores basi lutei, apice rubri.

Robust, glabrous plants lacking epicortical roots on the stem, but base of plant unknown; young stems somewhat fleshy and quadrangular, older stems ± terete and bearing numerous small pustular lenticels; lateral branches subtended by 2 or more pairs of scale leaves; prophylls subtended by distal foliage leaves very prominent, acute, 2 mm long. Leaves paired, when fresh with yellowish to brown margin and prominently raised, yellow lower midrib running into apex or nearly so, lanceolate, to 5 × 2.5 cm, petiole 3–5 mm, canaliculate; apex of blade acute, base obtuse to nearly truncate, venation pinnate. Inflorescences terminating leafy innovations, very compact, with 5 to 8 crowded pairs (sometimes trios?) of triads; triad peduncle angular, 7 mm long, the primary bract 2–5 mm long, caducous; all flowers on pedicels 5 mm long, the two lateral ones with a caducous bract similar to the primary one. Mature bud 3 cm long, straight, bright red above, yellow below, slightly expanded above the calyculus, and narrowing upward but expanding again somewhat below the nearly acute apex, ovary 5 mm long, narrow below, widening to 3 mm above, the calyculus smooth to very shallowly dentate; petals 2.5 cm long, very slightly dimorphic, becoming yellow at anthesis; ligule small, ca. 3 mm above base of petal; filaments 8 mm long, inserted at two different heights on the petals; anthers dorsifixed and versatile, 3 mm long, with small, terminal connectival horn; a few long, unbranched, and very slender yellow hairs also present, growing out from the petals near the insertion of the filaments; nectary small, 6-cornered. Pollen somewhat similar to that of *T. acutifolius* (Feuer & Kuijt, 1980, figs. 23 & 24), polar length ca. 12 μm, diameter slightly more than 20 μm, isopolar, *amb* triangular, deeply concave; tricolpate, syncolpate, the colpal portions nearest the poles psilate but from about halfway to the equator distinctly deepened, this portion also psilate but flanked by small, irregular marginal lobes; colpal margins raised, psilate, continuous across the equator where somewhat widening. Equatorial faces irregularly depressed rugulate-verrucate. Fruit red (*Roldán et al. 2375*).

Assignment of the new species to *Tripodanthus*

Figure 1. *Tripodanthus belmirensis* Roldán & Kuijt (based on *Fonnegra et al. 5400*, LEA). —a. Habit of flowering shoot. —b. Triad in bud, nearly mature (arrows: caducous bract and bracteole). —c. Style and two petals, and associated stamens, showing dimorphism. —d. Prophyll (L: leaf).

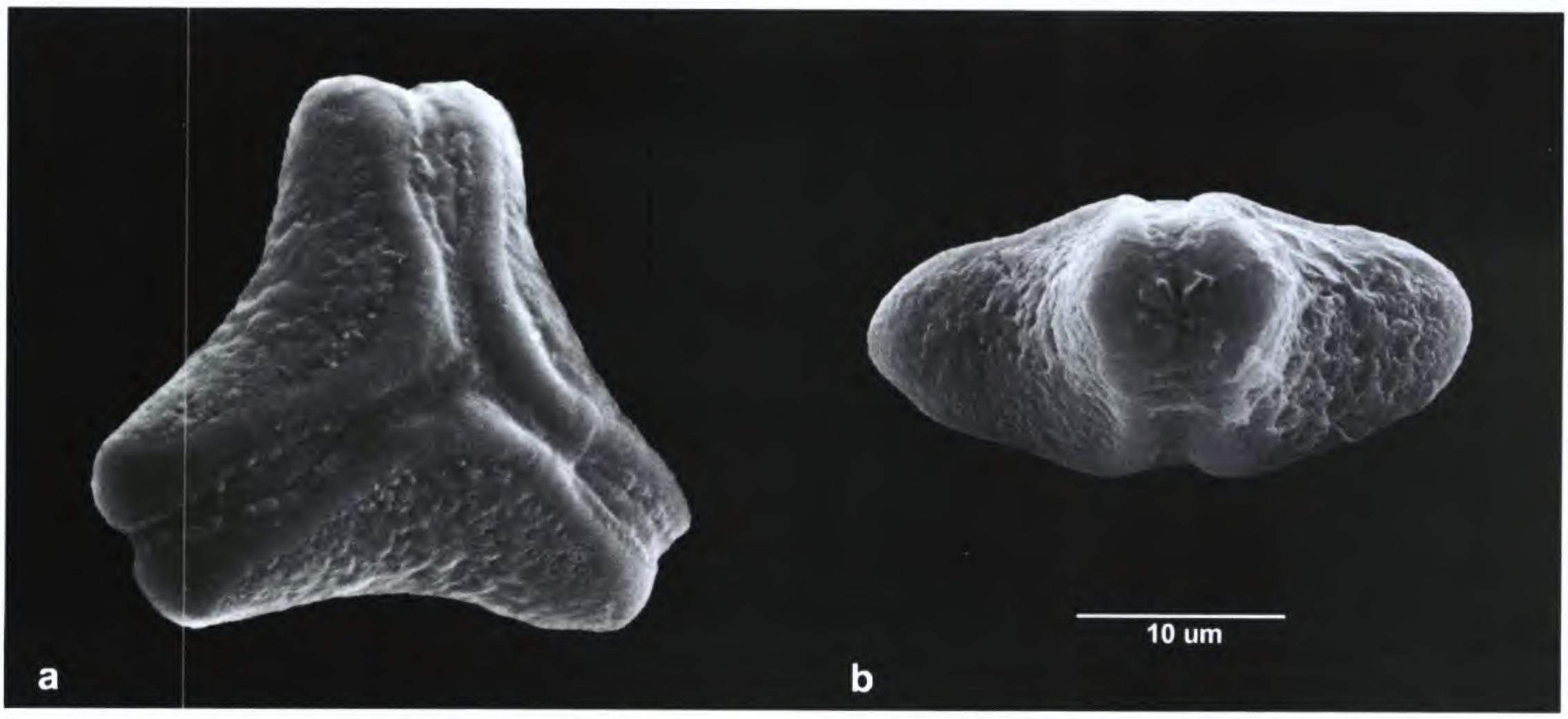

Figure 2. Pollen of *Tripodanthus belmirensis* (based on *Fonnegra et al. 5400*, LEA). —a. Polar view. —b. Equatorial view, showing pore.

would seem to be correct, but its occurrence at high elevation and its isolation from the other two species of *Tripodanthus*, neither of which are known from Colombia, is surprising. Other genera that might be considered briefly are *Gaiadendron* G. Don and *Tristerix* Martius. The former genus reaches from Bolivia to Venezuela and Mt. Roraima, and has the same subpáramo preference as our new species; it also has large bracts and bracteoles and flowers which, however, range from white to golden yellow and nearly orange. Its pollen structure is also somewhat similar to that of *T. belmirensis*, even though the syncolpus is very narrow. *Gaiadendron* shows a series of unique features relating to germination and establishment, which at this time cannot be checked in *T. belmirensis*. Among these are its frequently terrestrial habit, lack of primary haustorium, presence of a tuber in the seedling, and deeply grooved endosperm (Kuijt, 1963). It is extremely unlikely, however, that *T. belmirensis* shares those features.

The general aspect of the plant is much more reminiscent of *Tristerix* than *Tripodanthus*. Its leaves and especially the curious, acute prophylls are similar to those in some *Tristerix* species (Kuijt, 1988; see fig. 16e). Geographically, also, the range of *Tristerix* is suggestive. However, the occurrence of triads in the inflorescence, dimorphic stamens, and palynological details of *T. belmirensis* do not support assignment to *Tristerix* and agree with *Tripodanthus*. Chromosome numbers in *Gaiadendron* and *Tristerix* ($n = 12$) are very different from *Tripodanthus* ($n = 8$) (Barlow & Wiens, 1973), and knowing this characteristic in the new species would provide significant input, as would knowledge of its haustorial attachment; *Gaiadendron* lacks a primary haustorium, and *Tristerix* lacks epicortical roots and, if epicortical roots are present at the base of *T. belmirensis*, this would lend support to the present assignment. The curious caducous bracts and bracteoles are also present in *T. acutifolius* (Abbiatti, 1946, fig. 16A). Palynological features are strongly suggestive of *T. acutifolius* and *T. flagellaris* (Feuer & Kuijt, 1980), the densely packed equatorial rods or shorter sculpturing elements of those species, respectively, here seemingly replaced by a low rugulate-verrucate surface.

Paratypes. VENEZUELA. **Antioquia:** Mpio. Belmira, camino Belmira–San José de la Montaña, finca El Páramo, camino a Labores-San José, 3130 m, 6°35′N, 75°32′W, *Roldán et al. 2375* (HUA, LEA); Finca El Páramo, as the type, *Fonnegra et al. 5400* (HUA, LEA).

Acknowledgments. JK wishes to acknowledge the continuing financial support of the Natural Sciences and Engineering Research Council of Canada. We are obliged to David Lye and Brent Dowen for assistance with the photographs.

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A New Species of *Tibouchina* (Melastomataceae) from Minas Gerais, Brazil

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Abstract. The new species *Tibouchina rubrobracteata* belongs to section *Pleroma* D. Don. It is distinguished from related species by the presence of larger bracteoles than those usually found in section *Pleroma*, glabrous staminal filaments and style, the hypanthium not constricted at the apex, and a globose fruit. This species occurs in highland "campo rupestre" vegetation in the Serra da Canastra National Park in the state of Minas Gerais, an important center of endemism in Brazil.

Resumo. A espécie nova *Tibouchina rubrobracteata* pertence à seção *Pleroma* D. Don. É distinta das espécies próximas pela presença de bractéolas maiores que o usualmente encontrado na seção *Pleroma*, filetes e estilete glabros, hipanto não constrito no ápice e fruto globoso. Esta espécie ocorre nos campos rupestres do Parque Nacional da Serra da Canastra, no estado de Minas Gerais, um importante centro de endemismo.

Key words: Brazil, campo rupestre, endemic, highland vegetation, Melastomataceae, Minas Gerais, *Tibouchina*.

The region of Serra da Canastra is located in the Cerrados domain and contains many endemic species in different families (Romero & Nakajima, 1999). The vegetation of the region is composed of forests, including gallery forests that occur along creeks and rivers as well as small patches of cloud and montane forests, savanna with different physiognomic types, and campos rupestres, a mainly shrubby vegetation of rocky outcrops. This new species of *Tibouchina* was discovered during the floristic survey carried out by Herbarium Uberlandense (HUFU) from the Universidade Federal of Uberlândia in the Serra da Canastra National Park, southwestern Minas Gerais state, Brazil.

Tibouchina rubrobracteata R. Romero & P. J. F. Guimarães, sp. nov. TYPE: Brazil. Minas Gerais: São Roque de Minas, Par. Nac. Serra da Canastra, estrada para o sítio João Domingos, Serra da Canastra, afloramentos rochosos, 46°15′–47°00′W, 20°00′–20°30′S, 26 May 1996, *J. N. Nakajima & R. Romero 1807* (holotype, HUFU; isotypes, K, MO, RB, UEC, US). Figure 1A–F.

Frutex 0.4–1 m altus. Laminae ovado-oblongae, apice acuto, base rotundata, margine integro, supra et subtus sericeo, 5–7 nervis. Thyrsus 7–12 cm longus, 5–9 flores; 2-bracteolae concavae, 11.0–12.0 × 12.0–14.0 mm; flores 5-meri, pedicellati; hypanthium campanulatum; calyces lobis 6–8 × 3–4 mm, in fructu non persistentibus; 10 stamina, filamenta glabra; ovarium 5-loculare, apice sericeo-glanduloso; stylus glaber. Capsula globosa.

Shrub, 0.4–1 m tall, the stem, branches, petioles, leaves, inflorescence, bracteoles, and hypanthium densely covered with glandular hairs; branches quadrangular. Petioles 1.2–3.3 cm long; leaf blade 6.0–10.0 × 3.0–5.3 cm, ovate-oblong, apex acute, base rounded, margin entire, above sericeous, covered with eglandular and some glandular hairs, below sericeous, covered with glandular and eglandular hairs, 5- to 7-nerved, with inconspicuous lateral veins, confluent in the base. Thyrse terminal, 5 to 9 flowers, 7.0–12.0 cm long; bracteoles 2, 11.0–12.0 × 12.0–14.0 mm, red, asymmetrical, concave, outer surface densely covered with glandular hairs, caducous later. Flowers 5-merous, pedicellate, pedicels 1.8–3.0 mm long; hypanthium 5.5–8.5 × 6–8.0 mm, campanulate, not constricted at the apex; calyx lobes 6–8 × 3–4 mm, caducous in the fruit, triangular, apex acute, outer surface densely covered with glandular hairs, mainly on the lobe base, sometimes between the lobes with a glandular hair longer than the others; petals purple, 15.0–17.0 × 10.0–16.0 mm, obovate, apex rounded, glandular-ciliate, with an apical glandular hair

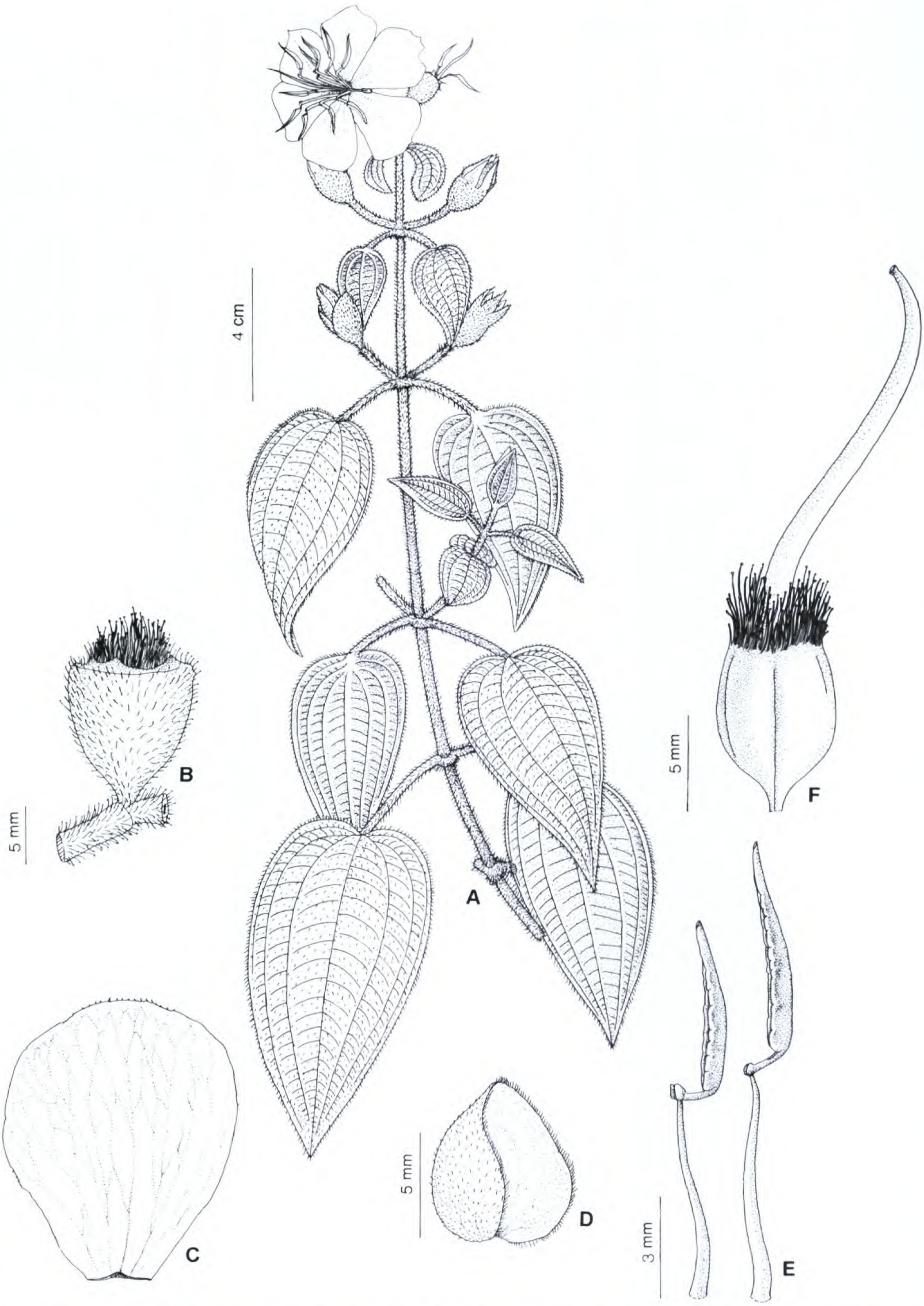

Figure 1. *Tibouchina rubrobracteata* R. Romero & P. J. F. Guimarães. —A. Habit. —B. Fruit. —C. Petal. —D. Bracteole. —E. Lateral view of stamens. —F. Ovary and style. Drawn from the holotype, *Nakajima & Romero 1807* (HUFU).

longer; stamens 10, subisomorphic; filaments 7.0–8.5 mm long, glabrous; anthers 7.0–8.0 mm long, subulate, apex attenuate, connective prolonged 1.7–2.2 mm below the thecae, with ventral bilobed appendage; ovary superior, 5-locular, free apical portion densely covered with glandular hairs; style 14.0–15.0 mm long, filiform, glabrous, stigma truncate. Capsule 6.7–7.8 × 6.3–7.0 mm, globose; seeds 0.5–0.7 × ca. 0.5 mm, numerous, cochleate, tuberculate.

Tibouchina rubrobracteata has 5-merous flowers in a thyrsoid inflorescence, two conspicuous bracteoles 11–12 × 12–14 mm, caducous, calyx lobes caducous in the fruit, and subulate anthers with attenuate apex. These characters refer *T. rubrobracteata* to section *Pleroma*, but the sectional limits in *Tibouchina* are weak since most sections reflect previously recognized genera, and they are not monophyletic clades on the basis of morphological characters.

The 11–12 × 12–14 mm bracteoles, a hypanthium not constricted at the apex, the capsule globose, as well as the filaments and style glabrous, distinguish *T. rubrobracteata* from *T. carvalhoi* Wurdack, to which it is most closely related. The latter differs in having smaller bracteoles, 2–5 × 0.7–0.75 mm, a hypanthium constricted at the apex, which is best observed during the development of the fruit, the capsule elongated, and the filaments and style with glandular hairs in the basal portion. *Tibouchina carvalhoi* is apparently endemic to Chapada Diamantina, Bahia state, Brazil. Wurdack (1983) related *T. carvalhoi* with *T. clidemioides* Cogniaux. We have examined the syntypes of *T. clidemioides* (in G and K) and can verify that the bracteoles are elongate (7–12 mm long), but much more narrow (2–3 mm), and the calyx lobes are also very narrow and, as in *T. carvalhoi*, the filaments and style have glandular hairs toward the base. According to Cogniaux (1883–1885), the type collection is from Vitória, Espírito Santo state, in eastern Brazil. These three species are strongly related by the indumentum of the branches, leaves, and shape of the inflorescence.

Tibouchina rubrobracteata is endemic to the region of Serra da Canastra, Minas Gerais, Brazil, on rocky slopes. This species flowers from April to August, and fruits from May to July.

The specific epithet refers to the characteristically red color of the bracteoles. This red coloration frequently can also be seen in the inflorescence, pedicels, hypanthium, and calyx lobes of *Tibouchina rubrobracteata*.

Paratypes. BRAZIL. **Minas Gerais:** São Roque de Minas, Par. Nac. Serra da Canastra, paredão da Cachoeira Casca d'Anta, 20 Apr. 1994, *R. Romero, J. N. Nakajima & F. A. G. Guilherme 959* (HUFU); paredão da Cachoeira Casca d'Anta, 22 Ago. 1994, *R. Romero, J. N. Nakajima & D. G. Simão 1151* (ESA, HUFU, SP); 3 km da sede administrativa, 10 May 1995, *J. N. Nakajima, R. Romero, M. B. Alcantara & C. A. Prado 1012* (HUFU, K), 15 May 1995, *J. N. Nakajima, R. Romero & M. B. Alcantara 1107* (C, HUFU), 15 July 1995, *J. N. Nakajima, R. Romero, M. A. Farinaccio & V. F. O. Miranda 2395* (HUFU, MBM, SPF); Cachoeira Casca d'Anta, 12 May 1995, *J. N. Nakajima, R. Romero, M. B. Alcantara & C. A. Prado 1050* (BHCB, HUFU, R); Cachoeira Casca d'Anta, 10 July 1996, *J. N. Nakajima, K. Ressel & F. A. G. Guimarães 1946* (HUFU, NY); Garagem de Pedras, 11 July 1996, *J. N. Nakajima, K. Ressel & F. A. G. Guimarães 2002* (HUFU, VIC); Delfinópolis, estrada da represa dos Peixotos, 22 May 1996, *R. Romero & J. N. Nakajima 3419* (HUFU, NY, RB, UEC, US).

Acknowledgments. The first author is grateful to the Universidade Federal de Uberlândia for the facilities of HUFU, the Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis (IBAMA) for permission to collect at Serra da Canastra National Park, Wagner Moreira Lima, former director of Serra da Canastra National Park, for logistical and facilities support, and the Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq Grant N° 300918/93-3) for a research grant. Fieldwork for this study had financial support from the Diretoria de Pesquisa from the Universidade Federal de Uberlândia. The authors thank Peter Gibbs for helpful corrections and Eduardo Kickhöfel for preparing the illustration.

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Heteroflorum: Un Nuevo Género del Grupo Peltophorum (Leguminosae: Caesalpinioideae: Caesalpinieae), Endémico para México

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Resumen. Se describe e ilustra a un nuevo género monotípico, arbóreo y dioico, endémico a México: *Heteroflorum* de las Leguminosae, Caesalpinioideae, Caesalpinieae, grupo Peltophorum, incluyendo la especie nueva *H. sclerocarpum* de la Cuenca Baja del Balsas y de la Planicie Costera del Pacífico Mexicano. Se le relaciona estrechamente con *Conzattia* y *Peltophorum*.

Abstract. A new monotypic arboreal and dioecious genus, endemic to Mexico, is described and illustrated: *Heteroflorum*, within the Leguminosae, Caesalpinioideae, Caesalpinieae, Peltophorum species group, including the new species *H. sclerocarpum* from the Balsas River basin and the Mexican coastal plains of the Pacific Ocean. The new taxon is closely related to *Conzattia* and *Peltophorum*.

Key words: Caesalpinieae, Caesalpinioideae, endemic, Leguminosae, Mexico, Peltophorum group.

México es considerado un centro secundario de diversificación de Leguminosae con 26 tribus, 135 géneros y 1724 especies (Sousa & Delgado, 1993); hoy día tenemos información de 139 géneros y 1850 especies (Sousa et al., 2001, 2003). Respecto al endemismo el 51.9% de las especies lo son, y a nivel de género se cuenta con cinco (3.6%), en las tres subfamilias, Caesalpinioideae, Caesalpinieae: *Conzattia* Rose y *Heteroflorum*; Mimosoideae, Mimoseae: *Calliandropsis* H. M. Hernández e Ingeae: *Guinetia* L. Rico & M. Sousa; Papilionoideae, Millettieae: *Hesperothamnus* Brandegee.

Heteroflorum pertenece a la tribu Caesalpinieae dentro de la caracterización planteada por Cowan (1981) y Polhill y Vidal (1981). Dentro de la tribu Caesalpinieae pertenece al grupo Peltophorum propuesto por Polhill y Vidal (1981), el cual, se sugiere un cambio de circunscripción por Lewis y Schrire (1995) pasando a *Conzattia* del grupo Caesalpinia al grupo Peltophorum. Haston et al. (2003) sugieren emplear los marcadores *trn*L intron y *trn*L-F del cloroplasto para delimitar al grupo Peltophorum incluyendo a 16 géneros, siendo el grupo de distribución pantropical.

Heteroflorum M. Sousa, gen. nov. TIPO: *Heteroflorum sclerocarpum* M. Sousa.

Arbores inermes; plantae per minutionem dioeciae. Folia bipinnata, stipulis acicularibus, mox caducis; pinnis oppositis, foliolis alternis. Inflorescentiae racemosae, racemis axillaribus, bractea florali ad basem pedicelli. Flores flavi, pedicellati, pedicello articulato, sine bracteolis, ad basem floralem hypanthium formantes; flores staminati quam pistillati majores; calyx gamosepalus, 5-lobatus, lobis integris; corolla 5 petalis distinctis, plus minusve isomorphis, ellipticis vel obovatis, sine unguibus; stamina 10, libera, filamentis ad basem pilosis, antheris versatilibus; ovarium sessile, multiovulatum; stylo tubulari, apice lato facto, piloso; stigmate circulari, lato, applanato vel leviter concavo. Legumen indehiscens, cylindricum, lignoso-scleroideum, laeve, dissepimentis fibroso-spongiosis; semina discoidea vel subsphaerica, hilo apicali; plantulae epigaeae, eophyllis alternis, 1-pinnatis, paripinnatis.

Árboles inermes, el tronco con proyecciones cónicas suberosas no espinosas. Hojas en disposición helicoidal, bipinnadas; estípulas aciculares, pronto deciduas; pinnas opuestas moderadamente numerosas, reducidas la basal y la apical; foliolos numerosos, alternos. Inflorescencias racemosas, racimos axilares, bráctea floral presente y subyacente al pedicelo. Plantas dioicas por reducción; flores amarillas, polinizadas por abejas, pediceladas, pedicelo articulado ± de la mitad al tercio superior, sin bractéolas, flores de 2 tamaños, las estaminadas de mayor tamaño que las pistiladas, la base de la flor desarrolla hipantio; cáliz gamosépalo, 5-lobulado, lobulos enteros; corola polipétala, 5-pétalos, ± homomorfos, elípticos a obovados, sin uñas; estambres 10 libres, exertos, los filamentos pilosos en la base, insertados en el ápice del hipantio; anteras versátiles, longitudinalmente dehiscentes hacia adentro; ovario sésil, 9–13-ovulado, estilo tubular, ensanchado en el ápice, piloso; estigma circular, ancho, aplanado a ligeramente cóncavo. Legumbre indehiscente, cilíndrica, leñoso-esclerótica, lisa, glabra, con tabiques fibroso-esponjosos entre las semillas formando cavidades seminíferas; semillas

discoides a subesféricas, con tegumento duro, hilo apical. Plántulas epigeas; cotiledones coriáceos; eofilos alternos, 1-pinnados, paripinnados.

Heteroflorum sclerocarpum M. Sousa, sp. nov. TIPO: México. Michoacán: La Huacana, a 11 km al O-SO de La Huacana, 300 m, 18 Jul. 1979, *Mario Sousa S. 10683, R. Sousa P., F. Guevara F., L. Ortiz Árias, A. Morelos Borja & J. Díaz de la Cruz* (holotipo, MEXU; isotipos, BM, MEXU, MO). Figura 1.

Arbor 3.5–15 m alta, foliis caducis, caule projecturis conicis 3-lobatis, suberosis, non spinosis, cortice laevi, plumbeo, cicatricibus foliaribus in lineis horizontalibus elevatis dispositis; rami fistulosi, sulcati, pilosiusculi, mox glabri, lenticellis aurantiacis numerosis, foliis spiraliter dispositis. Stipulae 7–9 mm longae, aciculares, patentes, mox caducae; folia 14–32 cm longa, bipinnata, pinnis (2–)4–7, (3.5–)5–6.5(–12) cm longis, in foliis immaturis oppositis, postea basin versus oppositis, apicaliter alternis, basali et apicali reductis vel parum reductis, irregulariter imparipinnatis, 21–27 foliolis in quaque pinna; petiolus 4–10 cm longus, eglandulosus, canaliculatus, sulcatus, pilosiusculus, mox glaber; rhachidi foliari 5–15(–23) cm longa, canaliculata, pilosa, in appendice 6–8 mm longa, aciculari, mox caduca terminata; foliolis 1–2.4 × 0.7–1.1 cm, alternis, ellipticis vel leviter oblongis, aliquantum bicoloribus, utrinque pilosis, base parum asymmetricis, apice obtusis, mucronatis. Inflorescentiae racemosae, racemis axillaribus, 4–18(–32) cm longis; bractea floralis staminata 4–5 mm longa, aciculari-filiformis, mox caduca; bractea floralis pistillata 4–7 mm longa, anguste elliptica vel anguste lanceolata, aliquanto persistens. Flores staminati 12–14 mm longi, hypanthio 2–3 mm longo; calycis lobis 5, 5–6 mm longis, ligulatis; petala flava, 9–10 × 4–5 mm, glabra, adaxialiter maculis aurantiacis; stamina 10, 9–10 mm longa, filamentis basi canescenti-pilosis, aliter glabris, antheris 0.8–1 mm longis; gynoecium 2.5–3 mm longum, moderate canescenti-pilosum. Flores pistillati 7–8(–11) mm longi, hypanthio 1.7–2(–3) mm longo; calycis lobis 5, 3.5–4.5(–8) mm longis, ligulatis; petala flava, 6–7(–10) × 2.7–3(–5) mm, glabra; staminodia 10, 5–7 mm longa, filamentis basi moderate vel sparse pilosis, aliter glabris, antheris 0.7–0.9 mm longis; gynoecium 6–7(–12) mm longum. Legumen (12–)14–18(–21) cm longum, 2.3–2.7 cm latum, indehiscens, lignoso-scleroideum, teres vel leviter applanatum, rectum vel leviter arcuatum, inter semina aliquantum constrictum, laeve, glabrum; semina 6–12 in quoque fructu, 8.3–10.5 × 8.3–11 × 6–8 mm, discoidea vel subsphaerica, laevia, nitida, atrobrunnea, duobus annulis pellucidis marginalibus.

Árboles 3.5–15 m alto, caducifolios, inermes, el tronco con proyecciones cónicas 3-lobadas, suberosas no espinosas; corteza lisa, pardo-plomiza, con cicatrices foliares en lineas horizontales y lenticelas ligeramente realzadas; ramas frecuentemente fistulosas, sulcadas, pilósulas, pronto glabras, con abundantes lenticelas anaranjadas, las hojas dispuestas helicoidalmente. Estípulas 7–9 mm largo, aciculares, patentes, pronto caducas; hojas 14–32 cm largo, bipinnadas, las pinnas (2–)4–7, (3.5–)5–6.5(–12) cm largo, en hojas inmaduras opuestas, posteriormente opuestas hacia la base, alternas apicalmente, la basal y la apical reducidas a ligeramente reducidas, irregularmente imparipinnadas, 21–27 folíolos por pinna; pecíolo 4–10 cm largo, eglandular, canaliculado, sulcado, pilósulo, pronto glabro; raquis foliar 5–15(–23) cm largo, canaliculado, pilósulo, rematando en un apéndice 6–8 mm largo, acicular, pronto caduco; folíolos 1–2.4 × 0.7–1.1 cm, alternos, elípticos a ligeramente oblongos, algo bicoloros, pilósulos en el haz y el envés, la base ligeramente asimétrica, el ápice obtuso, mucronado. Inflorescencias racemosas, los racimos axilares, 4–18(–32) cm largo; bráctea floral estaminada, 4–5 mm largo, acicular-filiforme, pronto caduca, bráctea floral pistilada, 4–7 mm largo, angostamente elíptica a angostamente lanceolada, algo persistente. Flores estaminadas, 12–14 mm largo; hipantio 2–3 mm largo; lóbulos del cáliz 5, 5–6 mm largo, ligulados, patentes, esparcidamente pilósulos; pétalos amarillos, 9–10 × 4–5 mm, glabros, el interior (estandarte) con máculas anaranjadas; estambres 10, 9–10 mm largo, los filamentos canescente-pilosos en la base, sino glabros, las anteras 0.8–1 mm largo; gineceo 2.5–3 mm largo, moderadamente canescente-piloso. Flores pistiladas, 7–8(–11) mm largo; hipantio 1.7–2(–3) mm largo; lóbulos del cáliz 5, 3.5–4.5(–8) mm largo, ligulados, patentes, pilósulos; pétalos amarillos, 6–7(–10) mm largo, 2.7–3(–5) mm ancho, glabros; estaminodios 10, 5–7 mm largo, los filamentos moderada a esparcidamente pilosos en la base, sino glabros, las anteras 0.7–0.9 mm largo; gineceo 6–7(–12) mm largo, densamente piloso en la base, esparcidamente en el estilo. Legumbre (12–)14–18(–21) × 2.3–2.7 cm, indehiscente, leñoso-esclerótica, rolliza a ligeramente aplanada, recta a ligeramente arqueada, algo constricta entre las semillas, lisa, glabra; semillas 6–12 por fruto, 8.3–10.5 × 8.3–11 × 6–8 mm, discoides a subesféricas, lisas, lustrosas, castaño oscuro, con bordes claros, formando dos anillos, hilo apical, tegumento grueso y duro.

Nombres vulgares. "Ojo de venado" (*J. L. Contreras J. 2381*, MEXU) [por el parecido superficial de sus semillas a las de *Mucuna*] (Guerrero); "frijolillo" (*M. Chazaro 748*, MEXU), "ojo de venado" (*J. C. Soto 3524*, MEXU), "teyapo" (*J. C. Soto 1419, D. Ramos*, MEXU), "vainilla" (*S. Rangel-Landa 549*, MEXU) (Michoacán), "maravillón del cerro" (*M. Elorsa C. 6093*, MEXU) (Oaxaca).

Usos. Forrajera (las hojas), la madera no tiene usos, dada su poca compactividad.

Distribución y hábitats. Se trata de una especie de la cuenca baja del Río Balsas y de la planicie

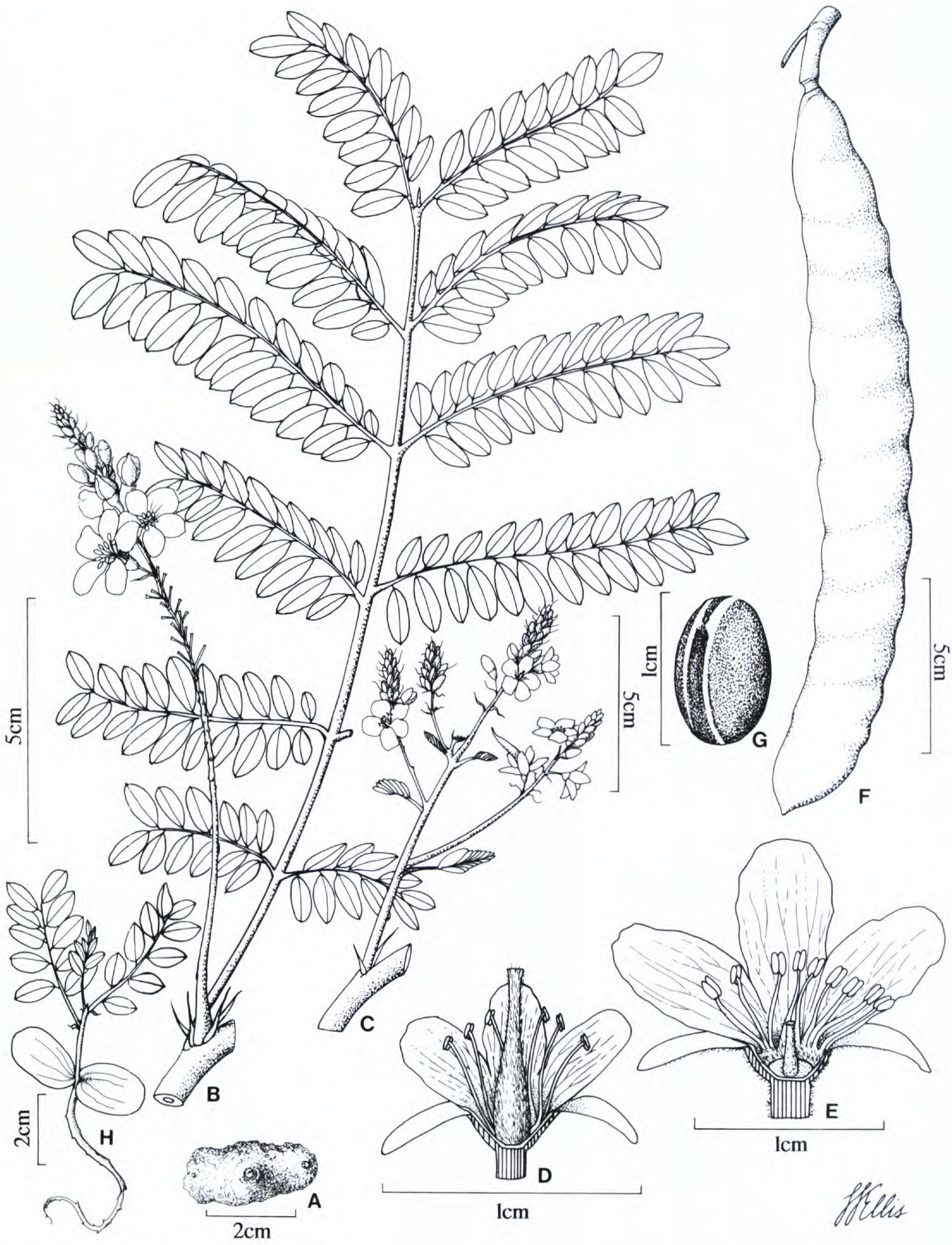

Figura 1. *Heteroflorum sclerocarpum* M. Sousa. —A. Proyección cónica del tronco. —B. Rama con inflorescencia estaminada (tomados del holotipo en MEXU, *Sousa et al. 10683*). —C. Rama con inflorescencias pistiladas. —D. Flor pistilada (tomados de *Soto et al. 1420*). —E. Flor estaminada (tomada de *Sousa et al. 10683*). —F. Fruto. —G. Semilla. —H. Plántula (tomados de *Toledo s.n.*).

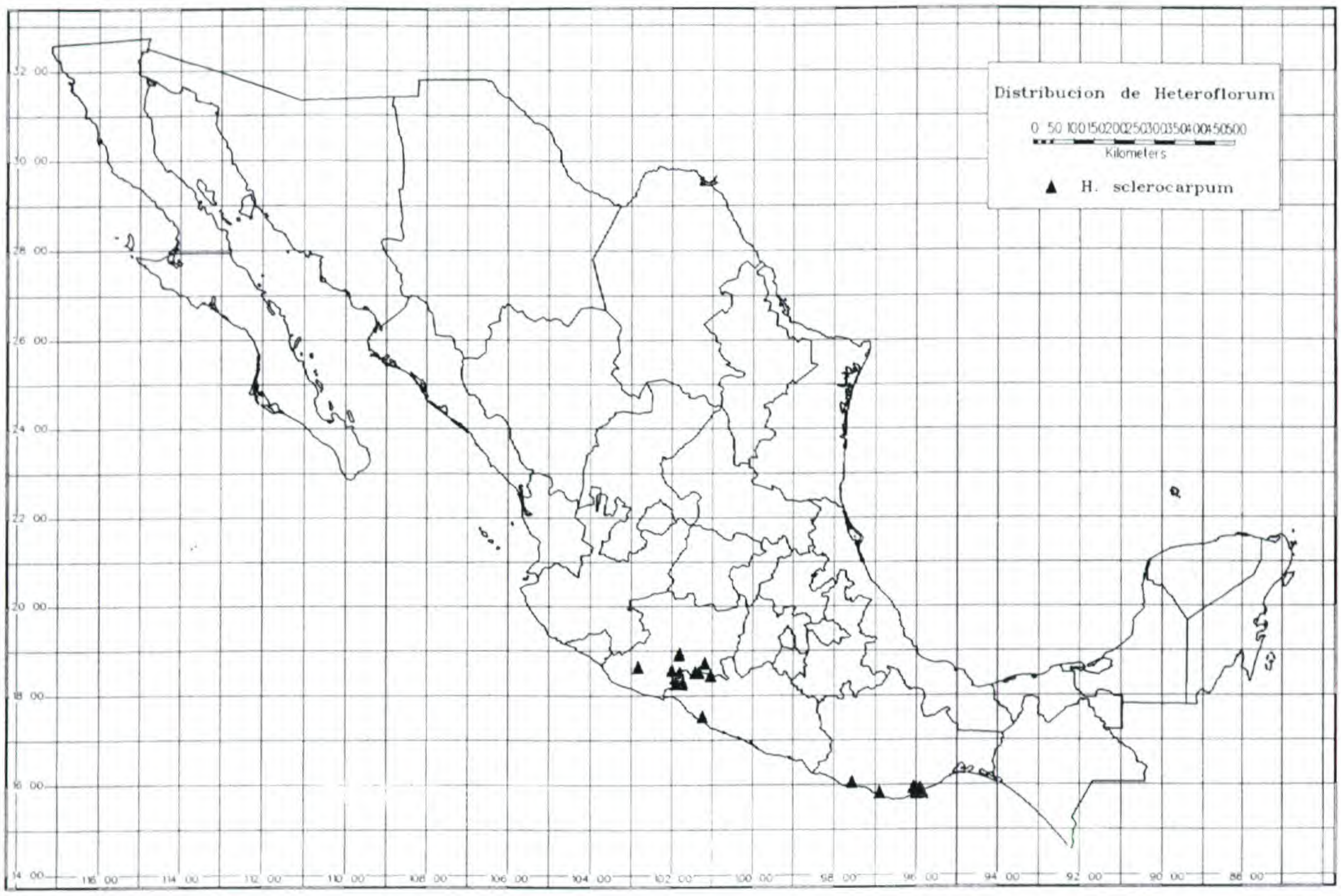

Figura 2. Distribución de *Heteroflorum sclerocarpum*.

costera del Pacífico (Fig. 2). En altitudes entre 15–600 m. En vegetación primaria de selvas bajas a medianas caducifolias, con *Cyrtocarpa procera* Kunth, cactáceas columnares, burseras, leguminosas, *Ziziphus* Miller y *Cordia* L. Riparia en ríos de temporal y permanentes. Sobre suelos someros con grandes rocas sedimentarias, en suelos arenosos, aluviales y tepetatosos.

Sus flores son visitadas por abejas, "mayates" hembras de *Xylocopa* (*J. C. Soto 1420, D. Ramos*, MEXU). Sus frutos son dispersados por corrientes de agua.

Fenología. Florece de finales de abril a finales de junio, fructifica, con frutos maduros de septiembre a diciembre.

Dentro del grupo Peltophorum, Haston et al. (2003) delimitan a un grupo monofilético central de ocho géneros, que comprende a *Schizolobium* Vogel, *Bussea* Harms, *Peltophorum* (Vogel) Bentham, *Parkinsonia* L., *Conzattia*, *Delonix* Rafinesque, *Colvillea* Bojer y *Lemuropisum* Perrier. De ellos *Heteroflorum* tiene mas afinidad con *Conzattia* y *Peltophorum* con los que morfológicamente constituye un subgrupo y comparten los siguientes caracteres:

Árboles inermes. Hojas en disposición helicoidal, bipinnadas; estípulas aciculares, pronto deciduas; pinnas opuestas; foliolos numerosos. Inflorescencias racemosas, bráctea floral presente y subyacente al pedicelo; flores amarillas, polinizadas por abejas, pediceladas, el pedicelo articulado, sin bractéolas, la base de la flor desarrolla hipantio; cáliz gamosépalo, 5-lobulado, los lóbulos enteros; corola polipétala, 5-pétalos; estambres 10 libres, exertos, los filamentos pilosos en la base, insertados en el ápice del hipantio; anteras versátiles, longitudinalmente dehiscentes hacia adentro. Plántulas epigeas; cotiledones coriáceos; eofilos alternos, 1-pinnados, paripinnados.

En la investigación en progreso Sotuyo (com. pers.) ha elaborado una filogenia preliminar de la tribu Caesalpinieae haciendo énfasis en *Caesalpinia* L. y géneros cercanos, empleando cuatro marcadores *trn*L, *trn*L-F, *trn*H-*psb*A *y* Acc*D*-*psa*I del cloroplasto, y encontró que *Heteroflorum* es el género hermano de *Conzattia*, y que el género *Peltophorum* es cercano.

Comparando a *Heteroflorum* con *Conzattia* y *Peltophorum* (véase Tabla 1) se puede apreciar que a pesar de los varios caracteres que comparten, *Heteroflorum* es marcadamente diferente sobre todo a nivel de flores, frutos y semillas.

Paratipos. MÉXICO. **Michoacán:** Arteaga, Cerca la Presa de El Infiernillo, *M. Cházaro B. 748* (MEXU); 29 km N of Presa El Infiernillo, *C. E. Hughes 1849* (MEXU);

Table 1. Comparación entre *Heteroflorum, Conzattia y Peltophorum.*

	Heteroflorum	*Conzattia*	*Peltophorum*
Foliolos	alternos	opuestos	opuestos
Flores de dos tamaños	si	no	no
Lóbulos del cáliz	patentes, aplanados	reflexos, cuculados	reflexos, cuculados a aplanados
Pétalos	homomorfos	heteromorfos	heteromorfos
Uñas de los pétalos	ausentes	presentes	presentes
Estilo	tubular robusto, se ensancha en el ápice	filiforme, no se ensancha en el ápice	filiforme, no se ensancha en el ápice
Estigma	ancho, circular aplanado, ligeramente cóncavo	capitado	ancho, aplanado y peltado
Legumbre	indehiscente, cilíndrica	dehiscente, aplanada	indehiscente, aplanada
Dispersión	por corrientes de agua	por viento	por viento y probablemente por agua
Semillas	discoidales a subesféricas	ovadas a lanceoladas	lanceoladas
Hilo	apical	subapical	subapical

14 km SW de la desv. a El Infiernillo, carr. La Presa, Carr. Nueva Italia–Playa Azul, *J. C. Soto N. 1086, A. Román de Soto* (MEXU, MO); cerros cercanos al poblado de El Infiernillo, *Soto 1649, G. Silva R.* (MEXU); 18 km SW de la desv. a El Infiernillo, carr. Arteaga–Nueva Italia, *M. Sousa 8050, J. C Soto & L. Sousa P.* (MEXU); 8.2 km by road NE of Puerto San Salvador, along Mex., *V. W. Steinmann 2422, G. Puime & B. Vrskovy* (MEXU); El Infiernillo, sólo frutos y semillas fueron colectados, *V. M. Toledo s.n.* (MEXU). Churumuco, 92 km de La Huacana, en la brecha a Huetamo, *E. J. Lott 2254, 2256, E. Martínez S.* (MEXU); 18 km W de San Jerónimo, camino a Churumuco, *E. Martínez S. 1445, J. C. Soto N.* (MEXU); Las Chicas, 15 km NW de San Jerónimo, *Soto 1419, D. Ramos T.* (MEXU); El Pitayo, 17 km NW de San Jerónimo, *Soto 1420, Ramos* (MEXU); 1 km NE de Nuevo Churumuco, *Soto 3524* (MEXU). La Huacana, 3 a 6 km SW de La Huacana, La Huacana, *Soto 1442, 2283, Román de Soto* (MEXU); El Varillo, 6 km SE de La Huacana, carr. a Inguarán, *Soto 3501* (MEXU). Tumbiscatío, El Caulote, 2 km SE de Las Cruces, *Soto 3610* (MEXU). **Guerrero:** Coahuayutla de Guerrero, 1 km NE de Matamoros, *J. Calónico Soto 15173* (FCME, MEXU); San José de Anota, 15 km N de Coahuayutla, camino Coahuayutla–Matamoros, *J. L. Contreras J. 2374* (MEXU); 1 km S de Coahuayutla, camino a La Unión, *Contreras 2379* (MEXU); El Mezquital, 6 km S de Coahuayutla, por el camino a La Unión, *Contreras 2381* (MEXU); El Infiernillo, 4 km S on the E bank of the Río Balsas, close to junction of track to Barranca San Diego, *C. E. Hughes 1845* (MEXU). Petatlán, Petatlán, 2 km SE, *C. D. Johnson 1265-79* (MEXU). **Oaxaca:** Pochutla, Miguel del Puerto, carr. hacia Santa María Xadani, 2 km N de Zimatán, *M. Elorsa C. 238* (MEXU); Rancho La Escalera, 15.6 km N de Puente Zimatán, *J. Rivera H. 2513* (MEXU); Rancho La Escalera, *A. Saynes V. 2202, 2203, 2204, M. Elorsa, N. Velásquez, E. Martínez S., M. Sousa S. & A. Reyes* (MEXU); Copalita, 15 km NE de Santa Cruz-Huatulco, *I. Trejo 2713, P. Tenorio L. & R. Dirzo* (MEXU). Tehuantepec, San Pedro Huamelula, por San Isidro Chacalapa, 5 km N de la carr. Costera, *Elorsa 600* (MEXU); 3 km N de Ayutla, camino a Guadalupe Victoria, *E. Martínez S. 32145, M. Elosa C. & C. Perret* (MEXU); Playa Grande, 500 m E, camino Laguna Agua Grande, *Rivera 2563* (MEXU); 4 km S de Chacalapa, *S. Salas M. 1773, Rivera* (MEXU); San Isidro Chacalapa, 5.5 km S, San Pedro Huamelula, *Salas 2922* (MEXU); Camino a Laguna Mazcalco, 500 m S, *Salas 2962* (MEXU); carr. a San Isidro Chacalpa, 5 km N de la carr. fed., *A. Sánchez A. 68, S. Salas M., J. Rivera H. & M. Elorsa C.* (MEXU). Santiago Astata, camino de la vereda hacia Zimatán a 3 km de Barra de la Cruz al NW, *Elorsa 263* (MEXU); por Marcalco a 2 km S de la carr., *Elorsa 456* (MEXU); Barra de la Cruz, 4 km E, *Elorsa 3027* (MEXU); 5 km la desv. a Chacalapa, por la carr. de Santiago Astata–San Pedro Pochutla, *G. Flores Franco 3662* (MEXU); Camino a Mazcalco, *Saynes 2056, S. Salas M. & M. Elorsa C.* (MEXU); 5 km N de la desv. a Chacalapa, la desv. 38 km SW de Astata, carr. Salina Cruz–Pochutla, *R. Torres C. 5224, C. Avendaño & J. Martínez* (MEXU).

Agradecimientos. A Jeny Solange Sotuyo V. por compartir información inédita y por revisar el manuscrito; a Fernando Chiang C. por traducir al Latín las diagnosis; a Gloria Andrade M. por resolver problemas del texto y recabar información; a Silvia Salas M. y José Carmen Soto N. por efectuar numerosas colectas ex profeso tanto en Oaxaca como en Michoacán respectivamente; a Linda Ellis por su magnífica lámina botánica y a Gabriela Sánchez C. por elaborar el mapa.

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Euphorbia derickii (Euphorbiaceae), a New Species from Central Mexico

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ABSTRACT. *Euphorbia derickii*, a new species in *Euphorbia* subg. *Chamaesyce* (Euphorbiaceae), is described and illustrated. It is endemic to central Mexico and presently known from 11 widely separated collections in the states of Guanajuato, Guerrero, Michoacán, and Morelos. Although similar to *Euphorbia hirta* and *E. lineata* in most features, it can be distinguished from these and all other Mexican species of *Euphorbia* subg. *Chamaesyce* by its seeds, which possess sharp, well-defined, uninterrupted, transverse ribs.

RESUMEN. Se describe e ilustra *Euphorbia derickii*, una especie nueva de *Euphorbia* subg. *Chamaesyce* (Euphorbiaceae). La especie nueva es endémica del centro de México y conocida de once colectas de los estados de Guanajuato, Guerrero, Michoacán y Morelos. Es semejante a *Euphorbia hirta* y *E. lineata* pero difiere de ellas y las otras especies mexicanas de *Euphorbia* subg. *Chamaesyce* por tener semillas con costillas transversales notarias, contínuas y con el borde agudo.

Key words: *Euphorbia*, Euphorbiaceae, Mexico.

Mexico is the center of diversity for *Euphorbia* L. subg. *Chamaesyce* Rafinesque (= *Chamaesyce* Gray), and I estimate that it contains ca. 110 of the nearly 300 species of this subgenus. Its members are well represented throughout the country in almost all types of vegetation from sea level to over 3000 m. During the preparation of the family Euphorbiaceae for the Mexican *Flora del Bajío y de Regiones Adyacentes*, various collections of a distinctive taxon were encountered from both within and outside the boundaries of the Flora. Because these plants do not appear to belong to any previously described species, they are here proposed as new.

Euphorbia derickii V. W. Steinmann, sp. nov. TYPE: Mexico. Morelos: mpio. Miacatlán, ejido Coatetelco, 10 km al E de Mazatepec, 14 abr. 1986, *Vázquez 45* (holotype, IEB; isotype, ENCB). Figure 1.

Planta annua, erecta vel ascendens, usque 35 cm alta; caules teretes; internodia 1–14 cm longa; folia opposita, petioli 1–4 mm longi, laminae ovatae, oblongae vel obovatae, 0.5–2.9 cm longae, 0.4–1.6 cm latae, apices obtusi, bases cuneatae vel hemicordatae, saepe obliquae, margines serrulati vel crenulati; cyathia in capitulis densis terminalibus; pedunculi 0.3–1.8 mm longi, glabri; involucra infundibuliformia vel campanulata, 1.1–1.6 mm longa, 0.8–1.0 mm diametro; glandulae 4, circulares vel transverse oblongae, 0.1–0.2 mm longae (radialiter), 0.1–0.3 mm latae (tangentialiter), concavae; appendices flabellatae, 0.2–0.9 mm longae, 0.3–0.8 mm latae, margines integri; flores staminati ca. 20–30; ovarium 3-lobatum; styli 3, 0.3 mm longi, bifidi, filiformes vel leviter clavati, ad apices leviter dilatati; capsula 3-lobata, 1.2–1.6 mm longa, 1.3–1.8 mm lata; columella 0.9–1.2 mm longa; semina ovoideo-quadrangulata, 0.9–1.0 mm longa, 0.6–0.7 mm lata, superficies dorsales costis transversis argutis continuis 6–8.

Plants annual, erect or ascending, to 35 cm tall; root slender, sometimes diffusely branched; primary stems single or many arising from the base, little branched below but much branched distally, terete, 0.8–4 mm thick, internodes 1–14 cm long, strigulose or rarely pilose, sometimes glabrate, trichomes 0.2–0.4 mm long, almost straight to slightly recurved, white to light brown or yellow. Leaves opposite, stipules interpetiolar, separate, undivided or laciniate into 3 to 5 segments, subulate to almost filiform, 0.8–2.4 mm long, glabrous to pilose, punctiform glands ca. 0.1 mm diam. sometimes present at the base of the stipules, petioles 1–4 mm long, strigulose, blades ovate to oblong or rarely obovate, 0.5–2.9 cm long, 0.4–1.6 cm wide, sometimes with a small lobe toward the base of one side and/or a red spot in the center, apex obtuse, base cuneate to hemicordate, frequently oblique, with a prominent midvein and 2 to 4 less-distinct lateral veins emerging from the base, glabrate above and sparsely strigulose below, margin irregularly serrulate to crenulate. Cyathia in dense, terminal, leafless capitula, peduncles 0.3–1.8 mm long, glabrous. Involucre funnelform to campanulate, 1.1–1.6 mm long excluding the glands, 0.8–1.0 mm diam. below the glands, glabrous below, strigulose above, lobes rectangular to triangular, 0.2–0.3 mm long, apex acute to truncate, glands 4, slightly stipitate, cir-

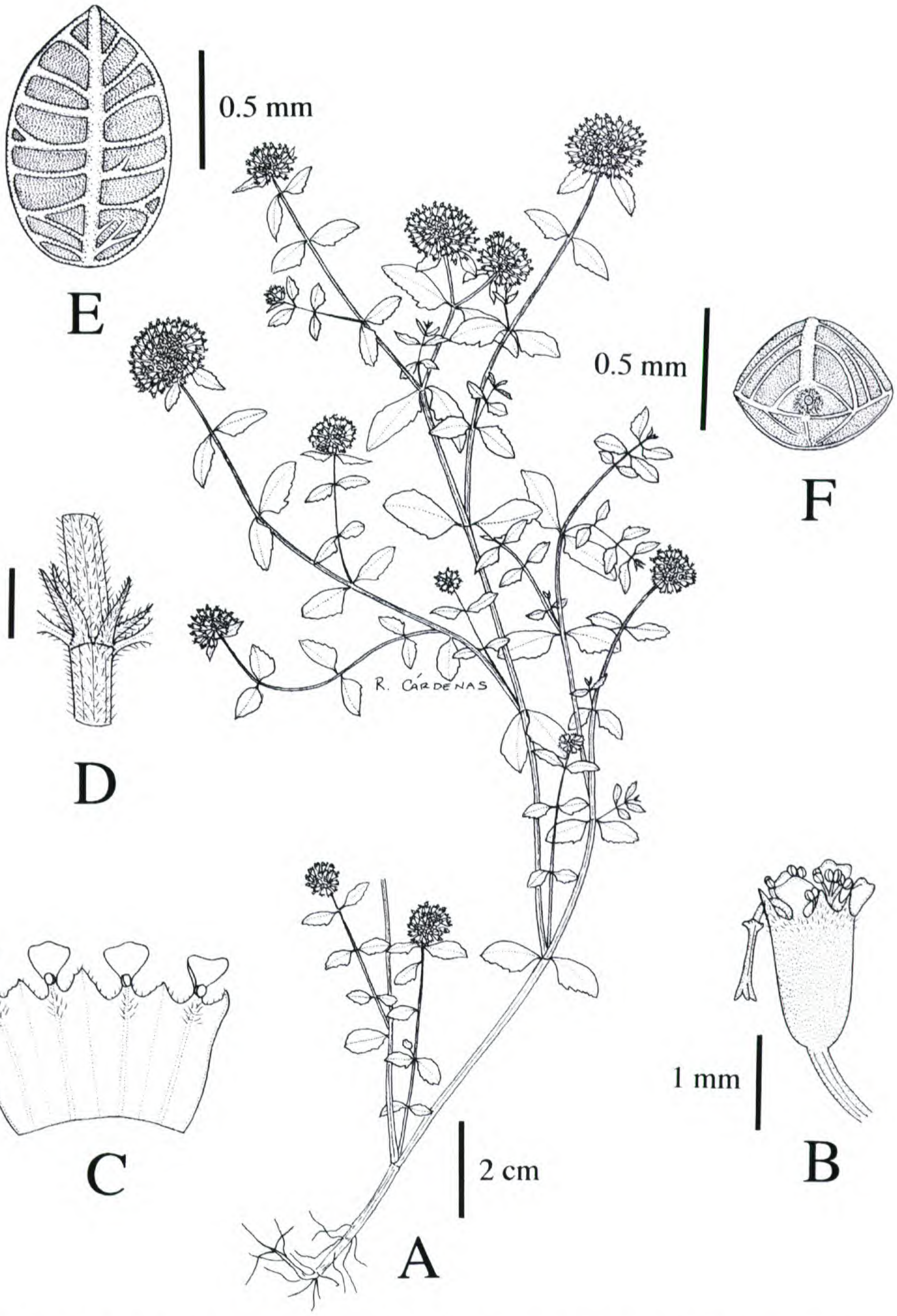

Figure 1. *Euphorbia derickii* V. W. Steinmann. —A. Habit. —B. Cyathium, side view. —C. Involucre, inner view. —D. Stipules. —E. Seed, dorsal view. —F. Seed, bottom view.

cular to transversely oblong, 0.1–0.2 mm long (radially), 0.1–0.3 mm wide (tangentially), concave, appendages flabellate, sometimes asymmetrical with one side prolonged, 0.2–0.9 mm long, 0.3–0.8 mm wide, entire, white and sometimes becoming purple-pink in age. Staminate flowers ± 20 to 30. Gynophore glabrous, exserted 0.5–1.1 mm, ovary strigulose, 3-lobed, styles 3, divided to the base, 0.3 mm long, filiform or slightly clavate, subcapitate. Capsules broadly ovate and widest below the

middle, 1.2–1.6 mm long, 1.3–1.8 mm diam., 3-lobed, shortly strigulose, shallowly furrowed between the carpels; columella 0.9–1.2 mm long. Seeds ovoid-quadrangular, 0.9–1.0 mm long, 0.6–0.7 mm wide, orange-brown, subacute to obtuse at the apex, obtuse to truncate at the base, the dorsal facets with 6 to 8 well-defined, sharp, narrow transverse ribs that do not pass through the dorsal keel, these generally uninterrupted but rarely anastomizing.

Distribution and habitat. *Euphorbia derickii* is endemic to central Mexico and currently known from 11 widely separated collections in the states of Guanajuato, Guerrero, Michoacán, and Morelos at elevations of 600 to 1750 m. Four collections are reported to have been made in cultivated fields. None of the remaining specimens provide specific information about the surrounding vegetation except one that is reported from an "open riparian area." However, based on the general vegetation of the localities where it has been encountered, it probably occurs in subtropical scrub and tropical deciduous forest.

Conservation status. At four of the known localities, this taxon was reported to be weedy in cultivated fields, and at two others it was described as abundant. Due to its tendency to invade disturbed habitats, it probably is not in danger of extinction at present.

Phenology. This species apparently is reproductive throughout the year under favorable conditions; it has been collected with flowers and fruits in July, August, October, January, February, March, and April.

Etymology. *Euphorbia derickii* is named in honor of my father, Derick Otis Steinmann (1943–2002), to whom I owe not only my existence but also many invaluable lessons about life.

Discussion. As noted by Wheeler (1941) and McVaugh (1961), the most useful distinguishing traits in many groups of *Euphorbia* subg. *Chamaesyce* are those of the capsules, seeds, and pubescence. For *Euphorbia derickii*, the seeds are most characteristic. In other features, this species strongly resembles both *E. hirta* L. and *E. lineata* S. Watson, and all of the collections were previously identified as one of these taxa. However, the sharp, well-defined, uninterrupted, transverse ribs of the seeds are unmistakable and serve to distinguish it from both of these species, whose seeds are rugulose or with subtle, mostly rounded transverse ridges. In fact, the seeds of *E. derickii* are so distinctive that they readily separate it from other North American and Mexican species of this subgenus.

Like most Mexican members of *Euphorbia* subg. *Chamaesyce*, the common name of *Euphorbia derickii* is *Golondrina* (*Rodríguez 1313*, *Torres 414*). Another common name is *Verdolaga Cimarrona* (*Torres 414*).

Paratypes. MEXICO. **Guanajuato:** mpio. Yuriria, Yuriria, margenes de la laguna, 3 sep. 1981, *Zizumbo Z-815* (IEB), *Z-816* (IEB). **Guerrero:** mpio. de Coyuca, Coyuca, 25 Jan. 1934, *Hinton et al. 5544* (K); km 12 carretera Chilpancingo, 22 ago. 1974, *Rodríguez 1313* (ENCB, MEXU). **Michoacán:** Coenqueño, Yurécuaro, 20 feb. 1982, *Flores 52* (IBUG). **Morelos:** Alpuyeca, 18 ago. 1949, *Atmar 77* (MEXU); Tlaltizapán, Centro Internacional de Mejoramente de Maiz y Trigo, 3 Sep. 1978, *Iltis et al. 831c* (MICH, WIS); Miacatlán, *Miranda 1282* (MEXU); mpio. Coatlán del Río, Coatlán del Río, 27 jul. 1976, *Torres 414* (MEXU); Mazatepec, 2 mar. 1968, *Vázquez 1499* (MEXU).

Acknowledgments. For access to their collections, I am indebted to the curators and staffs at IBUG, IEB, K, MEXU, MICH, and WIS. I thank Rogelio Cárdenas for preparing the illustration. Economic support was provided by a grant from the Comisión Nacional para el Conocimiento y Uso de la Biodiversidad to the Instituto de Ecología, A.C. (account number 902-03).

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Fourteen New Species of *Gonolobus* (Apocynaceae, Asclepiadoideae) from Mexico and Central America

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ABSTRACT. Fourteen new species of the genus *Gonolobus* (Apocynaceae, Asclepiadoideae) from Mexico and Central America are described and illustrated. *Gonolobus asterias*, *G. hammelii*, *G. truncatifolius*, *G. ustulatus*, and *G. variabilis* are endemic to Costa Rica. *Gonolobus grayumii* is from Costa Rica and adjacent Panama and *G. hadrostemma* is from Costa Rica and adjacent Nicaragua. *Gonolobus albiflorus*, *G. croceus*, and *G. sandersii* are from western Mexico. *Gonolobus pallidus* is from southern Mexico and *G. exannulatus* is from southern Mexico and Guatemala. *Gonolobus ancoriferus* is found in southeastern Mexico and Honduras and *G. cuajayote* is found in southern Mexico, El Salvador, and Nicaragua.

RESUMEN. Se describen e ilustran catorce nuevas especies del género *Gonolobus* (Apocynaceae, Asclepiadoideae) de México y Centroamérica. *Gonolobus asterias*, *G. hammelii*, *G. truncatifolius*, *G. ustulatus*, y *G. variabilis* son especies endémicas de Costa Rica. *Gonolobus grayumii* es de Costa Rica y Panamá y *G. hadrostemma* es de Costa Rica y Nicaragua. *Gonolobus albiflorus*, *G. croceus*, y *G. sandersii* son del oeste de México. *Gonolobus pallidus* es del sur de México y *G. exannulatus* es del sur de México y Guatemala. *Gonolobus ancoriferus* se encuentra en el sureste de México y en Honduras y *G. cuajayote* se encuentra en el sur de México, El Salvador y Nicaragua.

Key words: Apocynaceae, Asclepiadoideae, *Gonolobus*, Mesoamerica, Mexico.

Gonolobus is a genus of about 150 species ranging from the southern U.S.A. to Argentina and the Caribbean, with one species introduced in western tropical Africa. The greatest diversity is centered in southern Mexico and Central America, where a number of species remain to be described. This contribution continues the effort (Stevens & Montiel, 2002, 2004) to account for the known but undescribed species, now about half completed. To facilitate the description of individual species, a description of the genus is provided.

Gonolobus Michaux

Twining (*dextrorsum externe visus*) herbaceous or woody vines, corky bark absent from woody stems, stems nearly glabrous to variously pubescent, hairs of uniform length or more often a mixture of long hairs and short and/or short capitate-glandular hairs, indumentum of internodes uniform or arranged in 1 or 2 lines beginning between leaf axils and ending at leaf axils; latex white; roots fibrous. Leaves opposite, without pseudostipules, petiolate, with colleters at adaxial union of blade and petiole, lateral veins pinnate. Inflorescence extra-axillary, 1 per node or rarely with a second inflorescence borne on an axillary short shoot, racemiform or panuliculiform; calyx divided nearly to base, normally with colleters within below the sinuses; corolla rotate, campanulate with a rotate limb, or occasionally tubular, aestivation imbricate and dextrorse, mostly with a faucal annulus around corona, hairs of inside of corolla unicellular; androecium and gynostegium entirely fused and forming a gynostegium; corona gynostegial, of 5 largely connate lobes, adnate to base of gynostegium and to corolla; anthers indistinct, completely adnate to style apex, normally with a laminar or fleshy appendage on distal-dorsal margin, terminal appendages appressed to margin of style apex, guide rails linear, often indistinct, ± vertical or tilted under base of gynostegium; pollinaria ± horizontal, along anther margin, corpusculum mostly sagittate, translator prominently translucent-winged, pollinia symmetrically or mostly asymmetrically obovoid, rarely cylindrical, with proximal part sterile and ± excavated; style apex pentagonal or ± star-shaped, shallowly concave, smooth or rugose. Follicles 1 or 2, base asymmetrical, borne at 90°–180° to pedicel, mostly with 5 complete wings, occasionally with fewer and/or incomplete wings or rarely without wings, smooth to tuberculate; seeds numerous, obovate, flat, with a prominent margin, comose.

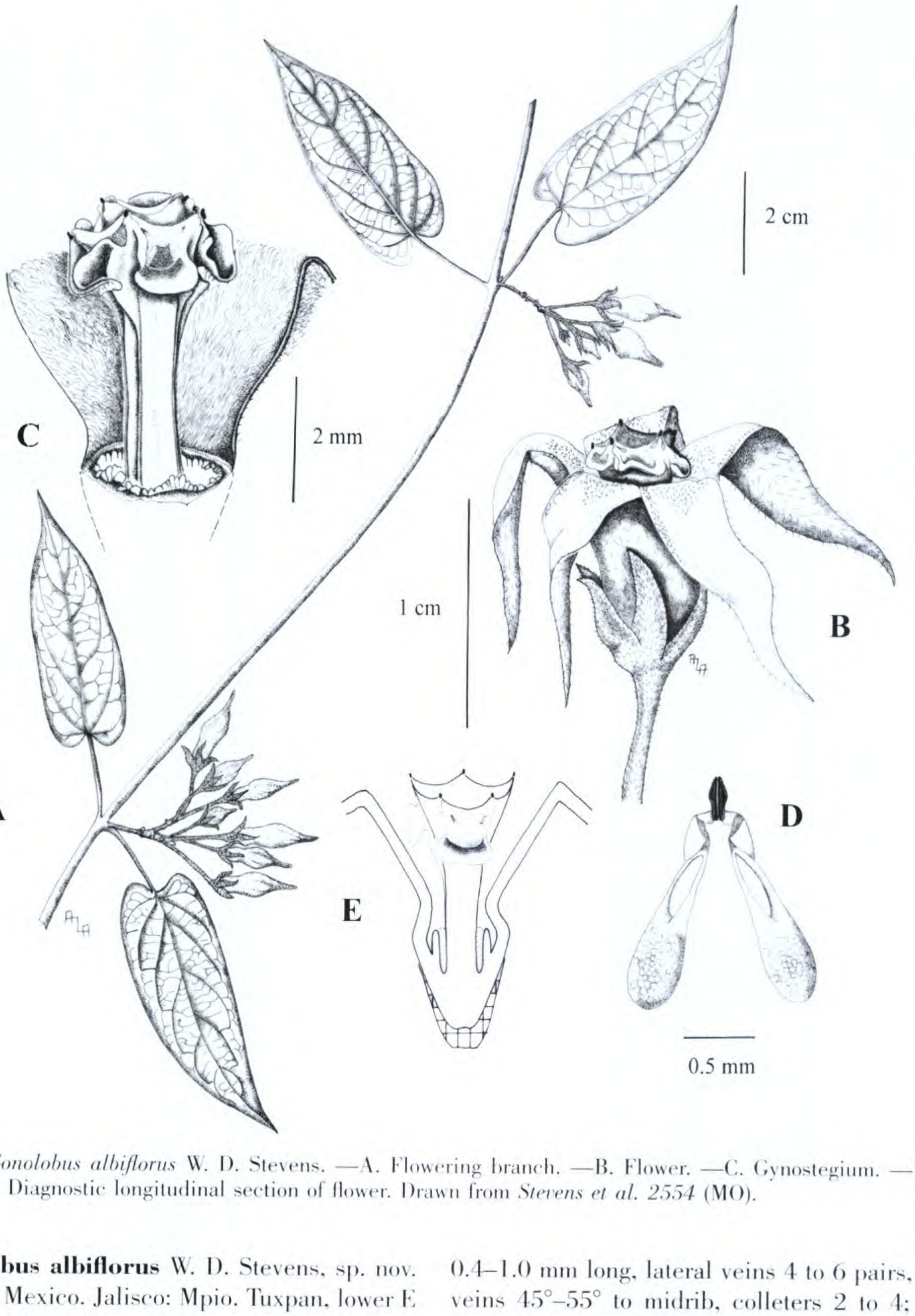


Figure 1. *Gonolobus albiflorus* W. D. Stevens. —A. Flowering branch. —B. Flower. —C. Gynostegium. —D. Pollinarium. —E. Diagnostic longitudinal section of flower. Drawn from *Stevens et al. 2554* (MO).

1. **Gonolobus albiflorus** W. D. Stevens, sp. nov. TYPE: Mexico. Jalisco: Mpio. Tuxpan, lower E slope of Nevado de Colima, ca. 1 mi. above Fresnito, 28 July 1976, *W. D. Stevens, M. J. Donoghue & M. L. Scott 2554* (holotype, MO; isotypes, ENCB, MSC). Figure 1.

Gonolobo gonoloboidi affinis sed floribus minoribus tubo corollae angustiore gynostegio exserto.

Perennial parts unknown, young stems densely white-pilose, hairs spreading to somewhat reflexed, 0.3–1.1 mm long, internodes 10–15 cm. Leaf blades ovate-elliptic, 5.4–8.5 × 1.8–3.8 cm, apex attenuate, base lobate, lobes descending, sinus 0.4–0.8 cm deep, ± densely glassy-pilose, hairs 0.4–1.0 mm long, lateral veins 4 to 6 pairs, middle veins 45°–55° to midrib, colleters 2 to 4; petiole 1.7–4 cm, densely white-pilose. Inflorescence congested-racemiform to paniculiform (twice-branched), 1- to 40-flowered, densely white-pilose, peduncle 2–11 mm, axis 0.5–11 mm, pedicel 9–17.5 mm, bracts 1.4–2.5 × 0.1–0.2 mm, linear; calyx tube 0.5–1.5 mm long, with 1 colleter per sinus, lobes elliptic to deltate with acute to attenuate tips, 4.5–6.4 × 1–1.4 mm, green or tinted purple, pilose outside, glabrous inside except tip pilose; corolla tubular, constricted in middle (above corona), uniformly white or tinted purple at base outside, tube 6–8.8 mm long, pilose outside with hairs 0.3–0.4 mm long except glabrous at base, in-

side white-velutinous with reflexed hairs 0.4–0.8 mm long except base glabrous, faucal annulus absent, lobes deltate to lanceolate with acute to attenuate tips, 9.5–12.5 × 2.6–3.4 mm, reflexed, pilose outside with hairs 0.3–0.4 mm long, inside glabrous except with curly, white hairs ca. 0.1 mm long in a dense fringe along the proximal half or two-thirds of one side and in a small triangle at base; gynostegium with stipe 5.5–6.3 × 0.6–1.3 mm, prominently 5-winged, each wing with a tooth near top, corona an erect, fluted, glabrous ring 1.2–1.5 mm long, adnate for most of length to corolla, anther appendages ± deflexed, spathulate, concave above, 1–1.6 × 0.9–1.6 mm in outline, fleshy, purple, terminal appendages tightly appressed to style apex, 0.1–0.2 × 1.2–1.4 mm, purple, guide rails straight, parallel, indistinct, 0.6–1.5 × 0.1–0.2 mm; corpusculum 0.3–0.39 × 0.11–0.13 mm, sagittate, dark brown, translators 0.35–0.38 × 0.15–0.18 mm, pollinia 1.02–1.08 × 0.3–0.33 mm; style apex 2.8–3.4 mm wide, yellow-green. Fruits and seeds unknown.

This species belongs, with *Gonolobus gonoloboides* (Greenman) Woodson and *G. arizonicus* (A. Gray) Woodson, in *Gonolobus* subg. *Pseudolachnostoma* Woodson, characterized by campanulate to tubular, white corollas without faucal annuli, relatively short coronas that do not line the inside of the corolla tube, and gynostegia with long stipes. This new species is easly distinguished from the other two by relatively narrower, reflexed corolla lobes, a relatively narrower corolla tube, and an exserted gynostegium. *Gonolobus albiflorus* seems to be restricted to a small area of the eastern slopes of the Nevado de Colima, Mpio. Tuxpan, Jalisco, Mexico, between 2000 and 2100 m elevation. It is known to flower in July and August.

Paratypes. MEXICO. **Jalisco:** Mpio. Tuxpan, 11 km al O de la carr. Atenquique–Colima, brecha al Playón, *J. Villa C., S. D. Koch & J. Chávez L. 861* (CHAPA, MO); antenas de microondas de Cerro Alto, 1 km al S de Atenquique, carr. a Colima, luego 14 km al O por brecha al Volcán de Colima y al Cerro Alto, *M. Fuentes O. 547* (CHAPA, MO).

2. Gonolobus ancoriferus W. D. Stevens, sp. nov. TYPE: Honduras. Yoro: 0.9 km E of San José Texiguat by road, then 3.5 km up Río Texigua, N of Cerro Cabeza de Negro, 15°29′N, 87°27′W, 200–300 m, 22 Apr. 1994, *A. E. Brant & D. Hazlett 2904* (holotype, MO; isotype, EAP). Figure 2.

Gonolobo xanthotricho affinis, a qua imprimis differt corona annulo 2–3plo longiore.

Perennial parts unknown, young stems with mixed indumentum, denser at the nodes, long hairs spreading or somewhat reflexed, pale yellow to brown, 0.5–2.5 mm long, short and glandular hairs white to dark brown, 0.05–0.15 mm long, internodes 5–24 cm. Leaf blades elliptic to oblong, 7.1–13.6 × 2.8–5.7 cm, apex acuminate, base rounded, truncate or shallowly lobate, lobes divergent to descending, sinus to 0.4 cm deep, adaxially glabrous or with sparse, appressed hairs 0.3–0.4 mm long, abaxially hispidulous with hairs 0.2–0.3 mm long, lateral veins 6 to 9 pairs, middle veins 60°–70° to midrib, colleters 2 or 3; petiole 1.1–2.7 cm, pilose. Inflorescence congested-racemiform, 2- to 16-flowered, peduncle 1–9 mm, glabrous or with sparse mixed indumentum, axis 2–7 mm, pedicel 17–37 mm, with dense mixed indumentum, bracts 1–1.5 × 0.2–0.3 mm, lanceolate or deltate; calyx tube 0.4–1 mm long, with 1 colleter per sinus, lobes lanceolate with acute tips, 5.3–6.4 × 2–2.4 mm, green or with purple or brown margins, abaxially hispidulose with hairs 0.2–0.9 mm long, adaxially glabrous; corolla rotate, green or yellow-green, apparently sometimes with red or purple markings, tube 2.2–3 mm long, glabrous, faucal annulus an erect tube, entire or inconspicuously 5-lobed, 0.5–1.1 mm tall, upper margin with a fringe of erect white hairs 0.6–1.5 mm long, corolla lobes ligulate, with thickened margins, nearly valvate, distally cucullate (tips inflexed in bud) and deeply rugose, apex rounded when flattened but strongly folded and contorted, glabrous inside, hispidulous outside with hairs 0.2 mm long or sometimes nearly glabrous, 6–8 × 3.2–4.3 mm, patent; gynostegium with stipe 1.5–2.1 × 0.4–1.4 mm, smooth or slightly 5-ribbed, corona fleshy, yellow-orange, bowl-shaped, 2.3–3 mm tall, 5-lobed, lobes angular, slightly retuse or entire, base adnate to annulus, anther appendages bifid, stalk patent, 0.9–1.2 × 0.6–0.8 mm, arms twisted and arching upward, 1.3–2 × 0.3–0.5 mm, tips of arms 2.5–4 mm apart, terminal appendages appressed to style apex, 0.2–0.3 × 1.6–2 mm, apparently white, guide rails straight, parallel, indistinct, ca. 0.15 × 0.1 mm; corpusculum 0.21–0.25 × 0.13–0.15 mm, sagittate, red-brown, translators 0.28–0.36 × 0.15–0.19 mm, pollinia 1.04–1.31 × 0.43–0.46 mm, symmetrical or slightly asymmetrical; style apex 2.3–3 mm wide. Fruits and seeds unknown; ovaries 5-ribbed, glabrous.

This new species is most similar to *Gonolobus xanthotrichus* Brandegee, but most conspicuously is much less pubescent overall, the corolla lobes are never barbate within, the dorsal anther appendages

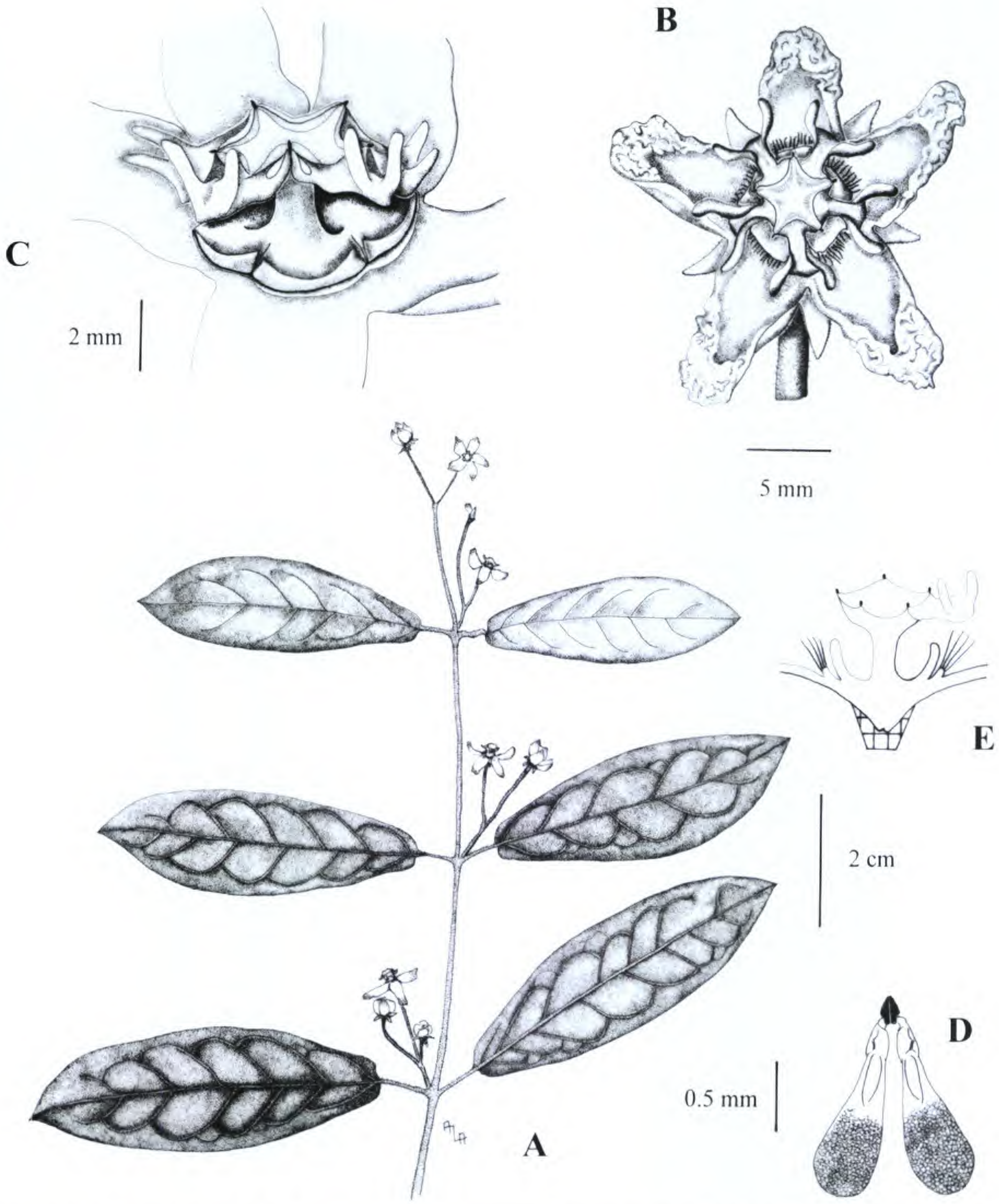


Figure 2. *Gonolobus ancoriferus* W. D. Stevens. —A. Flowering branch (*Hernández 1085*, MO). —B. Flower (*Martínez & Soto 18643*, MO). —C. Gynostegium (*Martínez & Soto 18643*, MO). —D. Pollinarium (*Martínez & Soto 18643*, MO). —E. Diagnostic longitudinal section of flower.

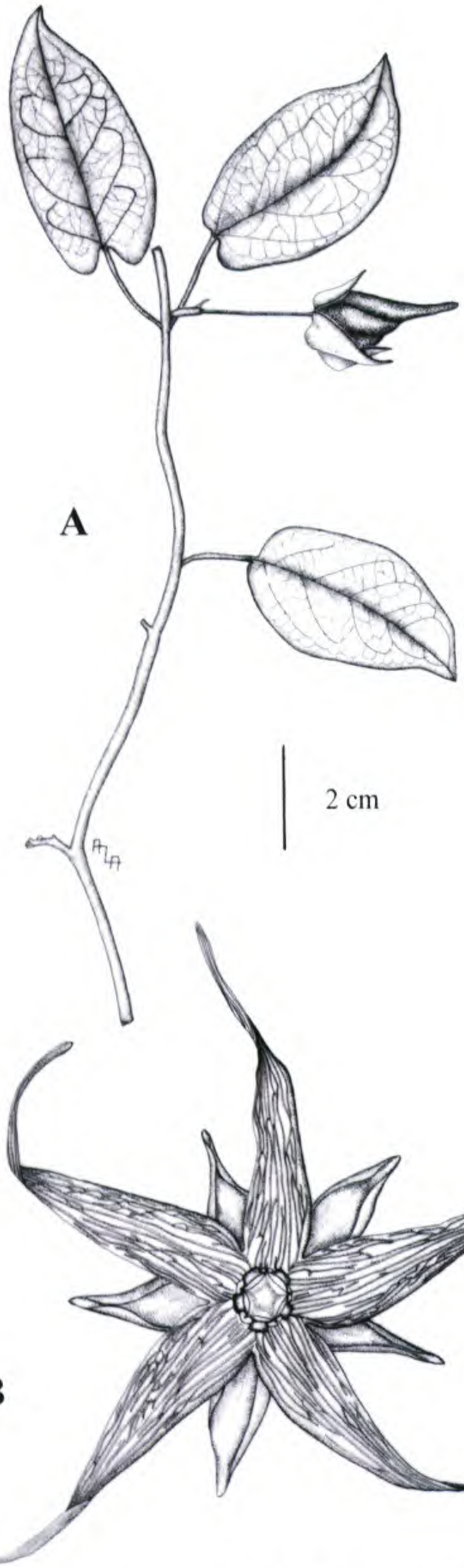
are longer and thinner, and the corona is two to three times longer than, rather than shorter than to equaling, the faucal annulus. This species has a relatively large distribution but seems to be uncommon; it has been found from sea level to 700 m and is known to flower from March to June.

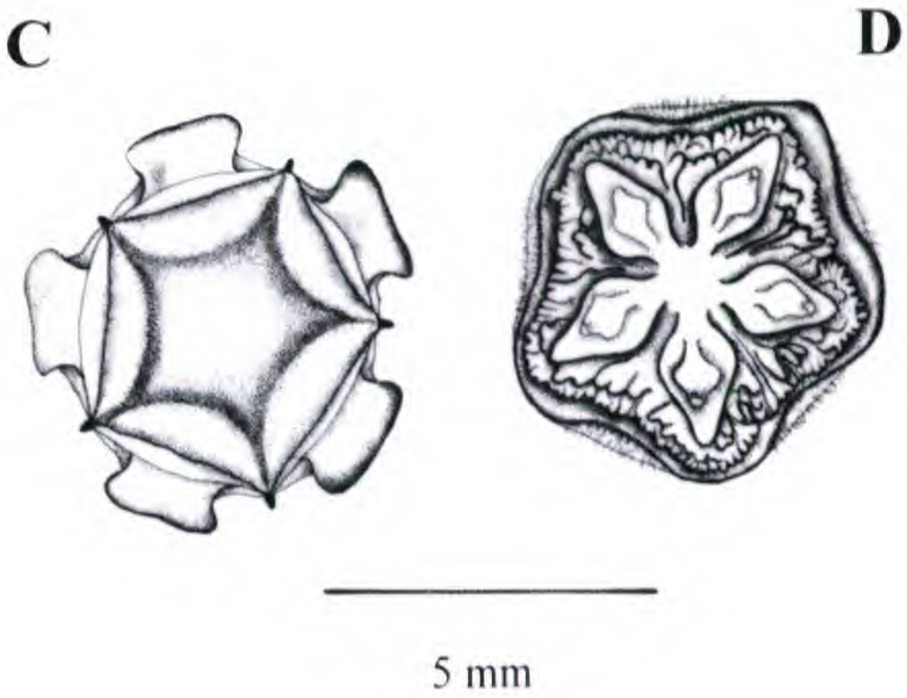
Paratypes. MEXICO. **Veracruz:** Mpio. Catemaco, Playa Escondida, 10 km N of Sontecomapan, *M. Nee 26692* (F, MO, NY, XAL); Mpio. San Andrés Tuxtla, Playa Balzapote, *R. Cedillo T. 3577* (MO). **Oaxaca:** Dpto. Juchitán, Mpio. Santa María de Chimalapa, Juyupac, 2.5 km al N de Santa María, *H. Hernández G. 1085* (CAS, MO). **Chiapas:** Mpio. Ocosingo, El Tumbo, camino Chancala–Monte Líbano, *E. Martínez S. & M. A. Soto A. 18643* (F, MEXU, MO).

3. Gonolobus asterias W. D. Stevens, sp. nov. TYPE: Costa Rica. San José: basin of El General, May 1940, *A. F. Skutch 4938* (holotype, US; isotypes, CR, F, NY). Figure 3.

Amplitudine et forma florum *Gonolobo versicolori* similis, praecipue differt calyce majore lobis corollae longioribus latioribus attenuatioribus ecarnosis.

Perennial parts unknown, young stems with mixed indumentum, most densely at the nodes and in 2 lines on internodes, long hairs ferrugineous, somewhat reflexed, 0.7–0.9 mm long, short and glandular hairs 0.04–0.06 mm long, internodes 4–8 cm. Leaf blades elliptic, 6.2–7.2 × 3.9–4.6 cm,





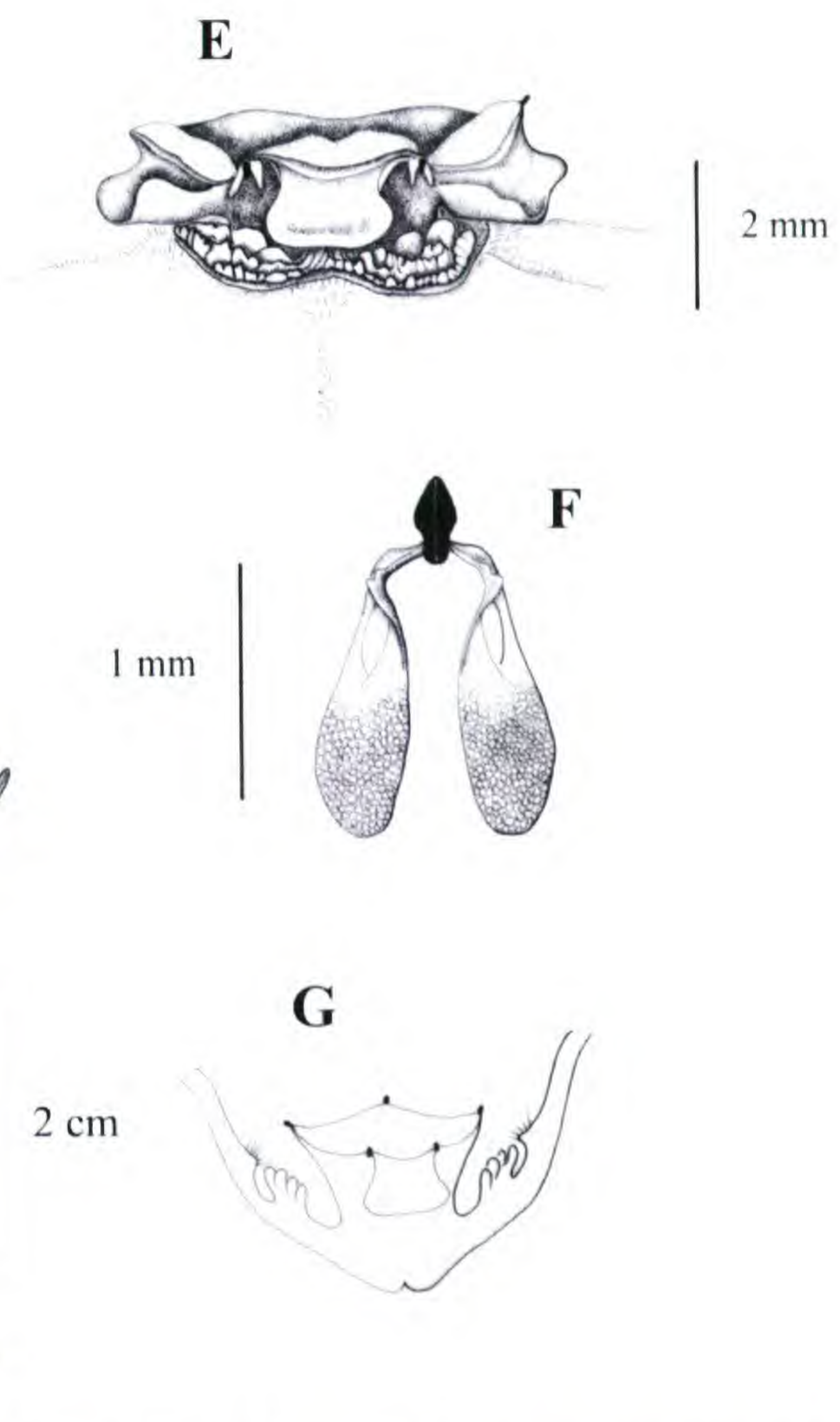


Figure 3. *Gonolobus asterias* W. D. Stevens. —A. Flowering branch. —B. Flower. —C. Gynostegium from above. —D. Corona and faucal annulus, from above with gynostegium removed. —E. Gynostegium, corona, and faucal annulus, from side. —F. Pollinarium. —G. Diagnostic longitudinal section of flower. Drawn from holotype, *Skutch 4938* (US).

apex abruptly acuminate, base lobate, lobes descending, sinus 0.2–0.4 cm deep, sparsely appressed-puberulent with hairs 0.1–0.2 mm long, lateral veins 5 to 7 pairs, middle veins 55°–60° to midrib, colleters 2, black with pale tips; petiole 1.9–2.7 cm, with short and glandular hairs, mostly on adaxial side and distally. Inflorescence congested-racemiform, 3- to 4-flowered, glabrous, peduncle 2–8 mm, axis 3–6 mm, pedicel ca. 45 mm, bracts 4–11 × 1.2–1.8 mm, lanceolate; calyx tube ca. 0.5 mm long, with 1 to 2 colleters per sinus, lobes lanceolate-attenuate with acute tips, 13–16 × 4.5–5.5 mm, green or tinted purple, glabrous or appressed-puberulent on distal margin; corolla rotate, green, glabrous except puberulent on faucal annulus and in lines from annulus to corolla sinuses, hairs erect, translucent, 0.1–0.2 mm long, tube 4–4.5 mm long, faucal annulus pentagonal in outline, of 5 erect lobes opposite corolla sinuses connected by a thin line, lobes deltate, ca. 0.4 mm tall,

corolla lobes lanceolate-attenuate with acute tips, 35–40 × 6–8 mm, apparently patent; gynostegium essentially sessile, corona a pentagonal disk, 1.3–1.6 mm wide, densely papillate, deeply rugose except 5 smooth patches, each smooth patch with a raised, fleshy cushion, anther appendages somewhat deflexed, somewhat bilobed, 0.8–0.9 × 2–2.2 mm in outline, laminar, terminal appendages tightly appressed to margin of style apex, ca. 0.3 × 2.7 mm, apparently translucent, guide rails straight, parallel, indistinct, ca. 0.1 × 0.1 mm, essentially horizontal under style apex; corpusculum ca. 0.38 × 0.16 mm, sagittate, pale brown, translators ca. 0.34 × 0.16 mm, pollinia ca. 1.23 × 0.48 mm; style apex ca. 4.7 mm wide. Fruits and seeds unknown.

This is a remarkable new species that in the years since its only collection, in 1940, has twice been supplied with manuscript names, but neither formal description was consummated. In floral morphology it is closest to *Gonolobus versicolor* Woodson and somewhat less so to *G. cteniophorus* (S. F. Blake) Woodson. Williams (1968) associated *Gonolobus breedlovei* L. O. Williams and *G. longipetiolatus* Woodson (= *G. salvinii* Hemsley) with *G. versicolor*, but I consider neither to be closely related. On the the other hand, there are at least two other undescribed Mexican species that share the very long and narrow corolla lobes, more or less entire dorsal anther appendages, and a discoid, deeply fimbriate corona.

Gonolobus asterias was found in a well-collected area of the best-known country in the American tropics. Since its large flowers would not be easily overlooked, especially not by the keen Costa Rican collectors, this species might well be extinct.

4. Gonolobus croceus W. D. Stevens, sp. nov. TYPE: Mexico. Sinaloa: Colomas, July 1897, *J. N. Rose 1717* (holotype, MO; isotypes, GH, US). Figure 4.

Gonolobo jaliscensi primo aspectu maxime simile, sed foliis fere glabris floribus 2–3plo majoribus corolla praeter annulum hirsutum glabra.

Perennial parts unknown, young stems glabrous or sparsely tomentose, especially at nodes, hairs 0.1–0.3 mm long, white or tinted red, internodes 11–16 cm. Leaf blades elliptic, lanceolate or narrowly obovate, 6.4–9.4 × 1.7–2.3 cm, apex acute to attenuate, base lobate to truncate, lobes descending to divergent, sinus to 0.4 cm deep, glabrous or sparsely pilose on midrib and margin, hairs 0.2–0.3 mm long, lateral veins indistinct, 5 to 8 pairs, middle veins 40°–60° to midrib, colleters 2 to 6; petiole 1.1–1.6 cm, glabrous or sparsely pilose. Inflorescence congested-racemiform, 1- to 8-flowered, peduncle 2–11 mm, glabrous or sparsely pilose in 1 line, axis 0.5–3 mm, pedicel 8–16 mm, sparsely pilose in 1 line, bracts 0.7–1 × 0.1–0.2 mm, linear to lanceolate; calyx tube 0.2–0.5 mm long, with 1 to 2 colleters per sinus, lobes elliptic with acute tips, 2.9–4 × 1.2–1.4 mm, green or tinted purple, glabrous or sparsely pilose at base outside and on margin; corolla tubular in basal half of connate part, then rotate, yellow (*Cowan & Nieves 4785*), drying yellow-green with deep green veins on base of corolla lobes, tube (connate part of corolla) 2.6–3.6 mm long (erect, tubular part 1–1.3 mm, reflexed part 1.6–2.6 mm), glabrous except on faucal annulus, faucal annulus erect, somewhat pentagonal in outline, densely hispid with erect, glassy hairs 0.15–0.4 mm long, lobes elliptic with obtuse tips, 5.5–7.2 × 3.2–4.3 mm, reflexed, glabrous outside, inside glabrous except sparsely white-papillose on basal half; gynostegium with stipe 0.7–0.8 × 0.7–0.8 mm, 5-ribbed, corona an erect, fluted, somewhat pentagonal, glabrous ring ca. 0.5 mm tall, anther appendages patent or somewhat deflexed, broadly spathulate, 0.4–0.7 × 1–1.4 mm in outline, fleshy, apparently white, terminal appendages tightly appressed to style apex, 0.2–0.4 × 1.1–1.5 mm, apparently translucent, guide rails straight, parallel, indistinct, 0.15–0.3 × 0.05–0.13 mm, essentially horizontal under style apex; corpusculum 0.17–0.18 × 0.07–0.08 mm, sagittate, dark brown, translators 0.3–0.35 × 0.17–0.18 mm, pollinia 0.6–0.7 × 0.22–0.3 mm; style apex 2.3–2.6 mm wide, apparently greenish white. Fruits and seeds unknown.

The known collections of this species are from the Pacific foothills of the central coast of Mexico, at about 900 m elevation; flowers are recorded from May to July. It is a distinctive species, with relatively small and narrow, bicolorous, nearly glabrous leaves and small, nearly glabrous flowers. It shares the leaf size and shape, small flowers, similar dorsal anther appendages, and general geographic area with *Gonolobus jalicensis* B. L. Robinson & Greenman. However, that species is found generally further to the south, is densely pubescent throughout, and has green rather than yellow corollas with the inner face densely white-hispid.

Paratypes. MEXICO. **Nayarit:** Mpio. San Blas, 3 mi. E of Jalcacatán, *D. H. Norris & D. J. Taranto 13138* (MO); Mpio. Tepic, 17.7 km al O de Tepic (ruta 15) sobre ruta 28 (66), 7 km al O de Carranza, *C. P. Cowan & G. Nieves H. 4785* (MO, TEX).

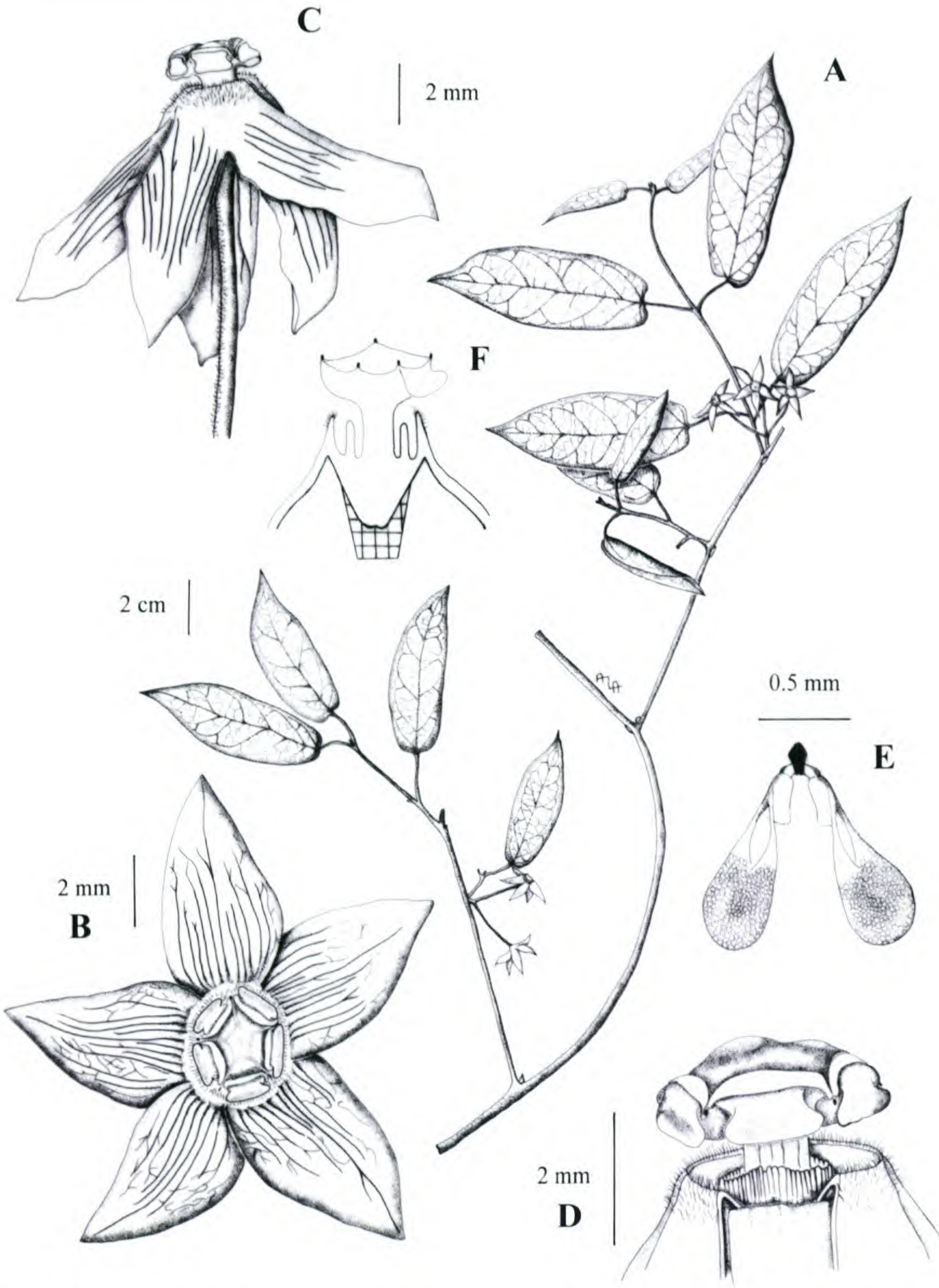


Figure 4. *Gonolobus croceus* W. D. Stevens. —A. Flowering branch (*Rose 1717*, MO). —B. Flower from above, flattened (*Cowan & Nieves 4785*, MO). —C. Flower from side (*Norris & Taranto 13138*, MO). —D. Gynostegium (*Norris & Taranto 13138*, MO). —E. Pollinarium (*Rose 1717*, MO). —F. Diagnostic longitudinal section of flower.

5. Gonolobus cuajayote W. D. Stevens, sp. nov. TYPE: Nicaragua. Managua: 2.3 km from Hwy. 12 on road along ridge of Sierra de Managua from Hwy. 12 at Km 17 to Hwy. 2, 12°04′N, 86°22′W, 450–550 m, 29 July 1977, *W. D. Stevens 2932* (holotype, MO). Figure 5.

Ex *Gonolobo nigro* corolla viridi pedunculis brevioribus annulo saepe ciliato distinguenda.

Herbaceous or woody below, young stems with mixed indumentum, denser at the nodes and in 2 lines on internodes, long hairs absent or restricted to nodes, spreading or somewhat reflexed, pale yellow, 0.3–0.7 mm long, short hairs white, 0.05–0.1 mm long, glandular hairs pale brown, ca. 0.05 mm long, internodes 2–15 cm. Leaf blades elliptic to ovate, 3.9–12.1 × 1.9–7 cm, apex acuminate, base lobate, lobes divergent to convergent, sinus 0.2–2 cm deep, adaxially glabrous to sparsely pilosulose with long hairs erect, 0.4–0.6 mm long, and short and glandular hairs on veins, abaxially with sparse mixed indumentum, lateral veins 5 to 7 pairs, middle veins 30°–40° to midrib, colleters 2 to 4; petiole 2.8–9.8 cm, with sparse mixed indumentum. Inflo-

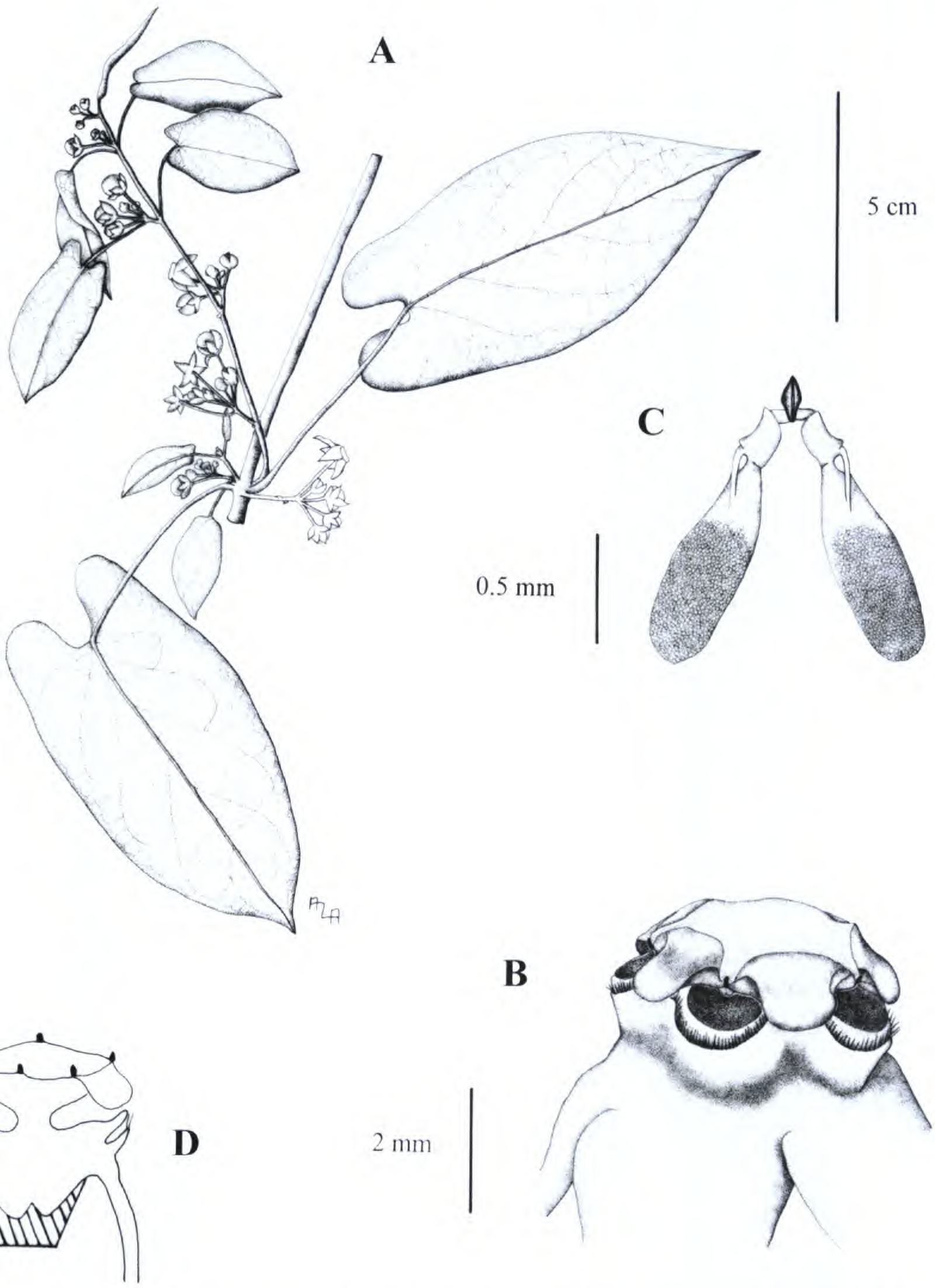


Figure 5. *Gonolobus cuajayote* W. D. Stevens. —A. Flowering branch (*Stevens 2932*, MO). —B. Flower from side (*Stevens 2932*, MO). —C. Pollinarium (*Villacorta 587*, MO). —D. Diagnostic longitudinal section of flower.

rescence 1 or rarely 2 per node, racemiform, 12- to 22-flowered, with mixed indumentum, peduncle (0–)15–22(–45) mm, axis 2–17 mm, pedicel 9–24 mm, bracts 1.1–2.2 × 0.2–0.4 mm, linear or deltate; calyx tube 0.7–1.7 mm long, with 1 colleter per sinus, lobes deltate with acute to rounded tips, 2.3–4 × 1.3–2.2 mm, bright green, abaxially glabrous or with sparse mixed indumentum on proximal half, adaxially glabrous; corolla rotate, deep green, abaxially densely hispidulose with short and glandular hairs 0.05–0.1 mm long, adaxially (except annulus) glabrous, tube 1.2–2.4 mm long, faucal annulus a membranous, erect lip, inconspicuously 5-lobed, 0.5–0.7 mm tall, upper margin glabrous or with a thin fringe of erect white hairs 0.2–0.3 mm long, corolla lobes lanceolate to elliptic, apex acute to obtuse or rounded, with conspicuous to inconspicuous auricles at the sinuses, one margin of each lobe with a thin, dull white callus, 4–7 × 3–4.2 mm, strongly reflexed; gynostegium with stipe 0.4–0.7 × 0.7–1.3 mm, 5-winged, each wing with a small, fleshy projection near top, corona fleshy, yellow-orange, bowl-shaped, 5-lobed, 0.4–0.8 mm tall, 1.3–1.8 mm wide at lobes, 0.7–1.4 mm wide at sinuses, anther appendages deflexed, reniform to nearly spathulate, somewhat fleshy, smooth, orange, 1–1.2 × 0.9–1.2 mm, terminal appendages appressed to margin of style apex, 0.2–0.5 × 1.8–2.4 mm, white, guide rails indistinct, ca. 0.2 × 0.1 mm; corpusculum 0.22–0.28 × 0.07–0.1 mm, sagittate, tip slightly hooked, red-brown, translators 0.22–0.34 × 0.12–0.15 mm,

pollinia 1.02–1.2 × 0.32–0.44 mm, symmetrical or slightly asymmetrical; style apex 3–3.6 mm wide. Follicles ellipsoid, apex obtuse, base abruptly narrowed, doubled back against follicle body, ca. 10 × 5 cm, with 2 complete wings 5–6 mm wide and 3 distal wing fragments, glabrous; seeds obovate, 7–8 × 4.3–4.55 mm, brown with brown-black radial streaks, margin 0.5–0.6 mm wide, crenulate on distal half, surface smooth, coma 2–3 cm long, white.

This new species is most similar to *Gonolobus niger* (Cavanilles) R. Brown ex Schultes, ranging from northeastern Mexico to Guatemala, and *G. roeanus* L. O. Williams, endemic to Guatemala. *Gonolobus roeanus* differs from the other two most prominently by having a thick, fleshy faucal annulus (vs. membranous), calyx lobes exceeding the corolla lobes (vs. about half the length), and the corolla internally papillate (vs. smooth and glabrous). *Gonolobus cuajayote* is more similar to *G. niger* but differs most conspicuously in having green corollas with a white callus along one side of each lobe rather than deep purple-black corollas with concolorous calluses, shorter peduncles, and a faucal annulus that is sometimes ciliate at the top, rather than always glabrous. *Gonolobus cuajayote* has winged follicles, while those of *G. niger* are unwinged, although the follicles of both are generally similar in size and shape; the follicles of *G. roeanus* are unknown. *Gonolobus niger* is most often found on limestone, while *G. cuajayote* is apparently restricted to soils of recent volcanic cinders. Furthermore, in the southern (Mesoamerican) part of the range of *Gonolobus niger* it has been found at elevations of 750 to 1700 m, while *G. cuajayote* occurs up to 900 m, with only two collection above 455 m. The species flowers from July to October and the single mature fruit was collected in March. In *Flora de Nicaragua* (Stevens et al., 2001: 251), this species was described as "*Gonolobus* sp. C."

Most, if not all, species of *Gonolobus* have fruits that are eaten when young, either raw or cooked. Most of the recorded local names are some orthographic variant of cuajayote, talayote, or cuchamper, and one of the common forms is borrowed for the epithet of this species (cf. Greuter et al., 2000, Art. 23.2).

Paratypes. MEXICO. **Chiapas:** Mpio. Cintalapa, 5 km W of Rizo de Oro, *D. E. Breedlove 36686* (CAS); Mpio. Esperanza, Contua, *E. Matuda 18342* (F). EL SALVADOR. **Ahuachapán:** P.N. El Impossible, Finca San Alfonso, *R. Villacorta, R. Toledo & R. López 853* (B, LAGU, MO). **La Libertad:** Volcán Caldera, *A. Monro, J. Monterossa & R. Carballo 3786* (MO); Quezaltepeque, Río Sucio, El Platanillo, *R. Villacorta 587* (B, LAGU, MO). NICARAGUA. **Chinandega:** Volcán San Cristóbal, Hacienda Las Rojas, *A. Grijalva, D. Soza & H. M. Hernández 3952* (MO); Los Balcones, 9 km de Somotillo, carr. a Cinco Pinos, *P. P. Moreno 11509* (MO); 3–4 km al SE de San Pedro de Potrero Grande, Los Laureles, *P. P. Moreno 11709* (MO); Carr. entre Cinco Pinos y San Francisco, *R. Rueda & R. Dolmus 1180* (HULE, MO). **León:** S base of Volcán Telica, above Quimera, *H. H. Iltis, B. F. Benz & A. Grijalva 30813* (MO, WIS). **Managua:** Reserva El Chocoyero, Sierra de Managua, *W. D. Stevens & O. M. Montiel 26520* (HNMN, MO).

6. Gonolobus exannulatus W. D. Stevens, sp. nov. TYPE: Mexico. Chiapas: Mpio. Angel Albino Corzo, between Finca Cuxtepeque and Finca Cabañas, 1100 m, 9 May 1988, *D. E. Breedlove & M. Bourell 67424* (holotype, CAS). Figure 6.

Species corolla alba omnino glabra rotata exannulata a congeneris distinguenda.

Perennial parts unknown, young stems with mixed indumentum ± concentrated in 2 lines, long hairs patent to reflexed, pale yellow, 0.4–1.2 mm long, short and glandular hairs 0.03–0.15 mm long, internodes 1–18 cm. Leaf blades elliptic or somewhat ovate, 6.4–8.3 × 3.3–5.4 cm, apex acuminate, base lobate, lobes descending to diverging, sinus 0.3–0.8 cm deep, adaxially glabrous or with sparse appressed or erect hairs 0.2–0.4 mm long, abaxially with erect hairs 0.2–0.4 mm long, mostly on the nerves, lateral veins 5 to 6 pairs, middle veins 35°–40° to midrib, colleters 4; petiole 2.2–3.2 cm, with mixed indumentum. Inflorescence congested-racemiform, 2- to 12-flowered, with mixed indumentum, long hairs sparse, peduncle 3–12 mm, axis to 5 mm, pedicel 12–19 mm, bracts 1.2–1.5 × 0.2–0.4 mm, lanceolate; calyx tube 1–1.5 mm long, with 1 colleter per sinus, lobes elliptic to lanceolate with obtuse to rounded tips, 5.2–7.5 × 3.1–3.5 mm, green, glabrous or with a few hairs on abaxial base, patent with recurved tips; corolla very briefly campanulate at base and then rotate, white or pale green, entirely glabrous, tube 3.1–3.5 mm long, faucal annulus absent, lobes ovate with obtuse to rounded tips, 9.5–12.5 × 5.2–6.1 mm, patent with recurved tips, gynostegium with stipe ca. 1.3 × 2.5 mm, 5-winged, corona an erect, fleshy, 5-lobed bowl, with 5 radial ridges continuous with wings of stipe, 1.2–1.5 mm tall at lobes, 0.8–1 mm tall at sinuses, anther appendages somewhat deflexed, oblong to rounded-trapezoidal and retuse, fleshy, somewhat concave, 1.9–2.2 × 2.8–3.4 mm in outline, terminal appendages tightly appressed to style apex, 0.1–0.2 × 2.2–2.4 mm, apparently translucent, guide rails straight, parallel, 0.8–1 × 0.1–0.2 mm, nearly vertical; corpusculum 0.25–0.26 ×

Figure 6. *Gonolobus exannulatus* W. D. Stevens. —A. Scan of holotype (*Breedlove & Bourell 67424*, CAS). —B. Close-up of flowers.

0.11–0.13 mm, sagittate, brown, translators 0.25–0.34 × 0.18–0.19 mm, pollinia 1.53–1.65 × 0.5–0.51 mm; style apex 3.7–4 mm wide. Fruits and seeds unknown, ovaries glabrous and 2-ribbed.

This new species, apparently known from four specimens, has an unusual set of characters. There are only a few species of *Gonolobus* with white or nearly white flowers, only a few that entirely lack a faucal annulus, only a few with an entirely glabrous corolla, and none other than this species with a combination of all three. The dark-colored anther appendages and corona contrast strikingly with the corolla. It has been collected at between 750 and 1500 m elevation and in flower in March and May.

Paratypes. GUATEMALA. **Guatemala:** near Finca La Aurora, *J. I. Aguilar 251* (F). **San Marcos:** Finca El Porvenir, *J. A. Steyermark 52310* (F). **Suchitepéquez:** near Pueblo Nuevo, *P. C. Standley 66925* (F).

Figure 7. *Gonolobus grayumii* W. D. Stevens. —A. Scan of holotype (*Hammel & Grayum 14096*, MO). —B. Close-up of flowers.

7. Gonolobus grayumii W. D. Stevens, sp. nov. TYPE: Costa Rica. Heredia: just S of Vara Blanca on road to San Miguel, 10°09′N, 84°10′W, 1900 m, 2 July 1985, *B. E. Hammel & M. H. Grayum 14096* (holotype, MO; isotype, CR). Figure 7.

Species notabilis appendicibus dorsalibus antherarum inflatis a speciebus mihi cognitis bene distincta.

Perennial parts unknown, apparently somewhat woody, older stems glabrescent, lenticellate, young stems with mixed indumentum, long hairs spreading to somewhat reflexed, white or pale yellow, 0.5–

1.5 mm long, short hairs 0.1–0.2 mm long, internodes 1–30 cm. Leaf blades ovate or elliptic, 7.1–11.7 × 3.2–7.5 cm, apex acuminate, base truncate to lobate, lobes descending to convergent, sinus to 1.5 cm deep, pilose, hairs 0.5–1.2 mm long, lateral veins 5 to 8 pairs, middle veins 40°–50° to midrib, colleters 4 to 6; petiole 2.8–7.5 cm, with mixed indumentum, short hairs sometimes absent. Inflorescence congested-paniculiform, nearly umbelliform or interrupted, 5- to 13-flowered, with mixed indumentum, short hairs sometimes absent, peduncle 4–77 mm, pedicel 6–36 mm, bracts 0.8–2.5 × 0.5–0.6 mm, deltate; calyx tube ca. 1.2 mm long, with 0 or 1 colleter per sinus, lobes lanceolate with attenuate tips, 10–10.5 × 2.5–3 mm, green, hispidulose, hairs outside 0.4–0.6 mm long, hairs inside 0.1–0.2 mm long; corolla short-campanulate then rotate, green, hispidulose outside with hairs 0.2–0.3 mm long, inside hispidulose, hairs brown, 0.2–0.3 mm long proximally, becoming shorter distally, tube ca. 3.5 mm long, faucal annulus an erect, 5-lobed lip, with the same indumentum as the adjacent tube, lobes ca. 1 mm tall, corolla lobes ovate to elliptic, cucullate, rugose, with obtuse to asymmetrically acuminate tips, 7.5–7.7 × 4.9–5.1 mm, reflexed; gynostegium with stipe ca. 1 × 1.5 mm, 5-ribbed at tip, 5-winged at base, corona a thin, 5-lobed disk with 5 radial wings continuing from stipe wings, ca. 1.5 mm wide at lobes, 1 mm wide at sinuses, adnate for most of length to corolla, anther appendages sharply deflexed, fleshy, spathulate when flattened, distal-lateral margins thickened, concave between, proximal margins thin, overlapping with proximal margins of adjacent appendages and covering corpuscula, 1.5–1.7 × 2.8–3 mm in outline, apparently purple, terminal appendages loosely overlapping style apex, ca. 0.2 × 1.8 mm, guide rails vertical, straight, parallel, ca. 0.5 × 0.1 mm; corpusculum ca. 0.38 × 0.23 mm, sagittate, dark brown, translators ca. 0.25 × 0.19 mm, pollinia ca. 1 × 0.3 mm, sinuately obovate; style apex ca. 2.8 mm wide. Follicles ovoid, apex acute, base broad, at a right angle to follicle body, 9.5–13 × 5–7 cm, with 2 complete or nearly complete wings 0.7–1 cm wide and 1 or 2 smaller wing fragments, glabrous, minutely tuberculate; seeds obovate, 8.5–8.7 × 4.4–5 mm, pale brown with darker brown streaks, margin 0.6–0.8 mm wide, crenulate on distal two-thirds, surface inconspicuously verrucose, coma ca. 3 cm long, white.

The dorsal anther appendages of this species are unlike any yet recorded for the genus; they are apparently inflated in natural condition and dry with the appearance of crinkled varnish. This is exactly the appearance of the dorsal appendages of *Fischeria* DC., but in that genus the dorsal appendages have grown to the point of subsuming the terminal anther appendages, while the terminal appendages of *Gonolobus grayumii* are still apparent, although thicker and more loosely attached than normal. Furthermore, *Fischeria* has abundant glandular hairs and smooth follicles, while *Gonolobus grayumii* lacks glandular hairs and has winged follicles. The first record of this species (*Tonduz 12185*) has been in collections for more than a century, but has only old inflorescences with all flowers fallen and young inflorescences with immature buds. It is curious that this original collection has short peduncles, up to 4 mm long, and more or less truncate leaf bases, while the two modern collections have peduncles 21–77 mm long and deeply lobate leaf bases, but otherwise the collections match well, including the several unique floral characters. The species has been found between 1390 and 1900 m elevation and has been collected in flower in May and July and with mature fruits in January and March.

Paratypes. COSTA RICA. **Puntarenas:** Buenos Aires, headwaters of Quebrada Dorora, 9 km NE of Ujarrás, *M. H. Grayum & A. Badilla 10268* (MO). **San José:** Au bord du Río Pedregoso au Copey, *A. Tonduz 12185* (BR, P, US). PANAMA. **Chiriquí:** S side of El Hato del Volcán, *M. Nee 14141* (MO, WIS).

8. Gonolobus hadrostemma W. D. Stevens, sp. nov. TYPE: Costa Rica. Puntarenas: Monteverde, 800 m, 29 Nov. 1980, *W. Haber 412* (holotype, MO). Figure 8.

Ex affinitate *Gonolobi calycosis* et specierum affinium corona ampla exserta, ex *G. hammelii* floribus minoribus pilis corollae brevioribus distinguenda.

Perennial parts unknown, young stems with sparse mixed indumentum, especially in the nodes, short hairs spreading, white with brown septa, 0.05–0.1 mm long, glandular hairs 0.05–0.1 mm long, internodes 10–18 cm. Leaf blades elliptic, 8.5–15.6 × 3–6.4 cm, apex acuminate to attenuate or occasionally apiculate, base abruptly and inconspicuously cordate, sinus 0.1–0.3 cm deep, adaxially glabrous or very sparsely puberulent with hairs 0.1 mm long, abaxially puberulent with hairs 0.2–0.3 mm long, lateral veins 6 to 11 pairs, middle veins 50°–60° to midrib, colleters 2 to 4; petiole 1.1–3.7 cm, with indumentum of stem. Inflorescence congested-racemiform, 2- to 6-flowered, with indumentum of stem, peduncle 1–2 mm, axis 0.5–4 mm, pedicel 7–14 mm, bracts 0.7–0.9 × 0.3–0.4 mm, deltate; calyx tube 0.5–0.7 mm long, with 1 colleter per sinus, lobes narrowly lanceolate to del-

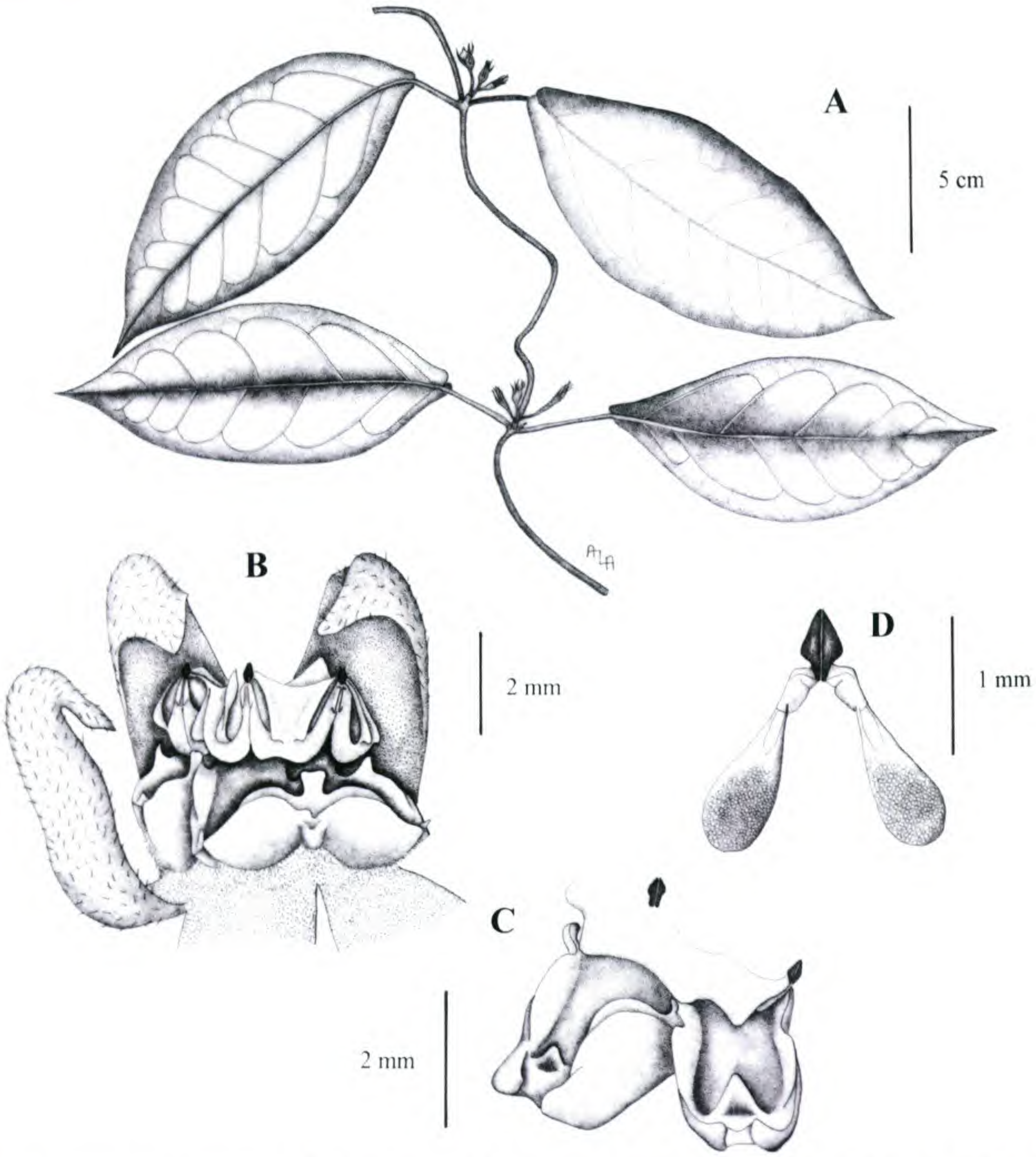


Figure 8. *Gonolobus hadrostemma* W. D. Stevens. —A. Flowering branch (*Moreno 6411*, MO). —B. Flower from side (*Moreno 6411*, MO). —C. Details of faucal annulus and corona (*Moreno 6411*, MO). —D. Pollinarium (*Moreno 6260*, MO).

tate, with acute tips, 5.5–10.3 × 0.9–1.8 mm, green or tinted purple, puberulent outside, glabrous inside; corolla rotate, cream or pale purple, distally puberulent outside with hairs 0.1–0.3 mm long, inside uniformly hispidulose with white hairs 0.05–0.1 mm long, tube 1–1.5 mm long, faucal annulus an erect tube, 5-lobed, 0.7–1.2 mm tall, lobes horizontal and adnate to the base of the corona, corolla lobes elliptic, with thickened margins, nearly valvate, distally somewhat cucullate (inflexed in bud), apex asymmetrically acute, 7.2–9.5 × 3.7–4.7 mm, reflexed; gynostegium with stipe 2.2–2.6 × 2.8–3.2 mm, with 5 wings entirely adnate to corona, corona fleshy, purple, bowl-shaped, 1.8–2.5 mm tall, with 5 cucullate lobes alternating with 5 blunt knobs above stipe wings, base adnate to and largely covering the annulus, anther appendages obsolete, reduced to 2 fleshy, marginal ridges, terminal appendages loosely overlapping style apex, 0.6–0.7 × 1.4–1.6 mm, pale purple, guide rails straight, indistinct; corpusculum 0.45–0.55 × 0.22–0.35 mm, sagittate with tip curved outward, red-brown, translators 0.3–0.43 × 0.2–0.28 mm, pollinia 1.13–1.4 × 0.55–0.6 mm, nearly symmetrical; style apex 3–3.7 mm wide. Fruits and seeds unknown; ovaries 5-ribbed, densely puberulent.

This species belongs to the group within *Gonolobus* originally described as *Trichostelma* Baillon. The group is characterized by having an erect, tubular faucal annulus and a corona that is almost entirely adnate to the inside of the annulus tube

and adnate to the gynostegium stipe by narrow wings, creating 5 deep nectaries. Additionally, the corolla lobes are only slightly overlapping and with inflexed tips in bud, resulting in corolla lobes that often have thickened margins, more or less symmetrical disposition of the indumentum, and are distally somewhat to distinctly cucullate. The anthers are oriented more to the margin of the gynostegium than under the style apex and the dorsal anther appendages that are a unique feature of *Gonolobus* are often reduced or even obsolete. This new species, and the related *Gonolobus hammelii* described below, differ from the others in having a massive corona that is exserted from and largely obscuring the annulus tube; the annulus is also more prominently lobed than in the other species of the group. In *Flora de Nicaragua* (Stevens et al., 2001: 251), this species was described as "*Gonolobus* sp. B."

Paratypes. NICARAGUA. **Granada:** Volcán Mombacho, arriba y SE de Hacienda Cutirre, *P. P. Moreno 6260* (MO); Volcán Mombacho, Finca San Joaquín, *P. P. Moreno 6411* (MO). **Rivas:** Volcán Maderas, *P. McGillivary 86* (F).

9. Gonolobus hammelii W. D. Stevens, sp. nov. TYPE: Costa Rica. Puntarenas: Canton de Osa, Valle del Térraba, fachada S de Fila Retinta, al N de Palmar Norte, Quebrada Benjamín, 8°59′N, 83°28′W, 300 m, 13 Dec. 1989, *B. E. Hammel & M. H. Grayum 17699* (holotype, MO; isotypes, CR, MO). Figure 9.

Ex affinitate *Gonolobi calycosis* et specierum affinium corona ampla exserta, ex *G. hadrostemma* floribus majoribus pilis corollae longioribus distinguenda.

Perennial parts unknown, young stems glabrous except with very sparse mixed indumentum at the nodes, short hairs spreading, white with brown septa, 0.2 mm long, glandular hairs 0.1 mm long, internodes 12–25 cm. Leaf blades elliptic, paler below, 13.5–16 × 6.3–7 cm, apex acuminate, base abruptly and inconspicuously cordate, sinus 0.1–0.2 cm deep, adaxially glabrous, abaxially sparsely puberulent with hairs 0.1 mm long, lateral veins 10 to 11 pairs, middle veins 60°–70° to midrib, colleters 4 to 7, raised on a fleshy pad and somewhat connate; petiole 2.4–3.6 cm, glabrous. Inflorescence congested-racemiform, 2- to 4-flowered, with mixed indumentum of short and glandular hairs, peduncle 1–2 mm, axis 1–2 mm, pedicel 18–20 mm, bracts ca. 0.4 × 0.2 mm, deltate; calyx tube ca. 0.1 mm long, with 2 colleters per sinus, lobes narrowly lanceolate with acute tips, 7.5–7.9 × 1.6–1.7 mm, green with purple margins, with mixed indumentum outside, glabrous inside; corolla rotate, deep purple-black, distally puberulent outside with appressed hairs 0.1 mm long, inside uniformly hispidulose with white hairs 0.5–0.8 mm long on tube and annulus and gradually decreasing to 0.2 mm long at tips of lobes, tube ca. 2.2 mm long, faucal annulus an erect tube, 5-lobed, 1.4–2.3 mm tall, lobes horizontal and adnate to the base of the corona, corolla lobes elliptic, with thickened margins, nearly valvate, distally slightly or not at all cucullate (slightly inflexed in bud), apex acute, 12–12.5 × 6.1–6.4 mm, reflexed; gynostegium with stipe ca. 0.7 × 1 mm, 5-ribbed, corona fleshy, purple, bowl-shaped, 1.5–3 mm tall, angularly 5-lobed, each lobe with small tooth directed toward gynostegium, base adnate to annulus, anther appendages obsolete, reduced to a fleshy pad on base of anther back, terminal appendages appressed to style apex, 0.3 × 1.8 mm, apparently pale purple, guide rails indistinct; corpusculum ca. 0.43 × 0.28 mm, sagittate with tip curved outward, red-brown, translators ca. 0.38 × 0.15 mm, pollinia ca. 1.16 × 0.71 mm, asymmetrical; style apex ca. 3.3 mm wide. Fruits and seeds unknown; ovaries 5-ribbed, glabrous.

This new species is most closely related and superficially quite similar to *Gonolobus hadrostemma*, but differs in significant details. The differences in the size, color, and indumentum of the flowers could be an artifact of the few known collections, but the nearly sessile gynostegium and the lack of the partitions connecting the corona and the gynostegium stipe are important distinctions.

10. Gonolobus pallidus W. D. Stevens, sp. nov. TYPE: Mexico. Chiapas: near Laguna Ocotal Grande, ca. 25–30 km SE of Monte Líbano, 950 m, 12 Aug. 1954, *R. L. Dressler 1655* (holotype, NY; isotype, US). Figure 10.

Amplitudine et forma florum *Gonolobo versicolori* aemulans, differt foliis fere glabris lobis corollae glabrissimis ecarnosis.

Perennial parts unknown, young stems with mixed indumentum, most densely at the nodes and in 2 lines on internodes, nearly glabrous at mid-internode, long hairs pale yellow, sharply reflexed, 0.4–0.6 mm long, short and glandular hairs 0.05–0.1 mm long, internodes 3–18 cm. Leaf blades elliptic to obovate, bicolorous, 7.6–12.2 × 2.8–5 cm, apex acuminate, base acute, obtuse or rounded, adaxially glabrous or with a few hairs at base of midrib and margin, abaxially with erect short and glandular hairs 0.05–0.2 mm long, lateral veins 6 to 10 pairs, middle veins 60°–65° to midrib, col-

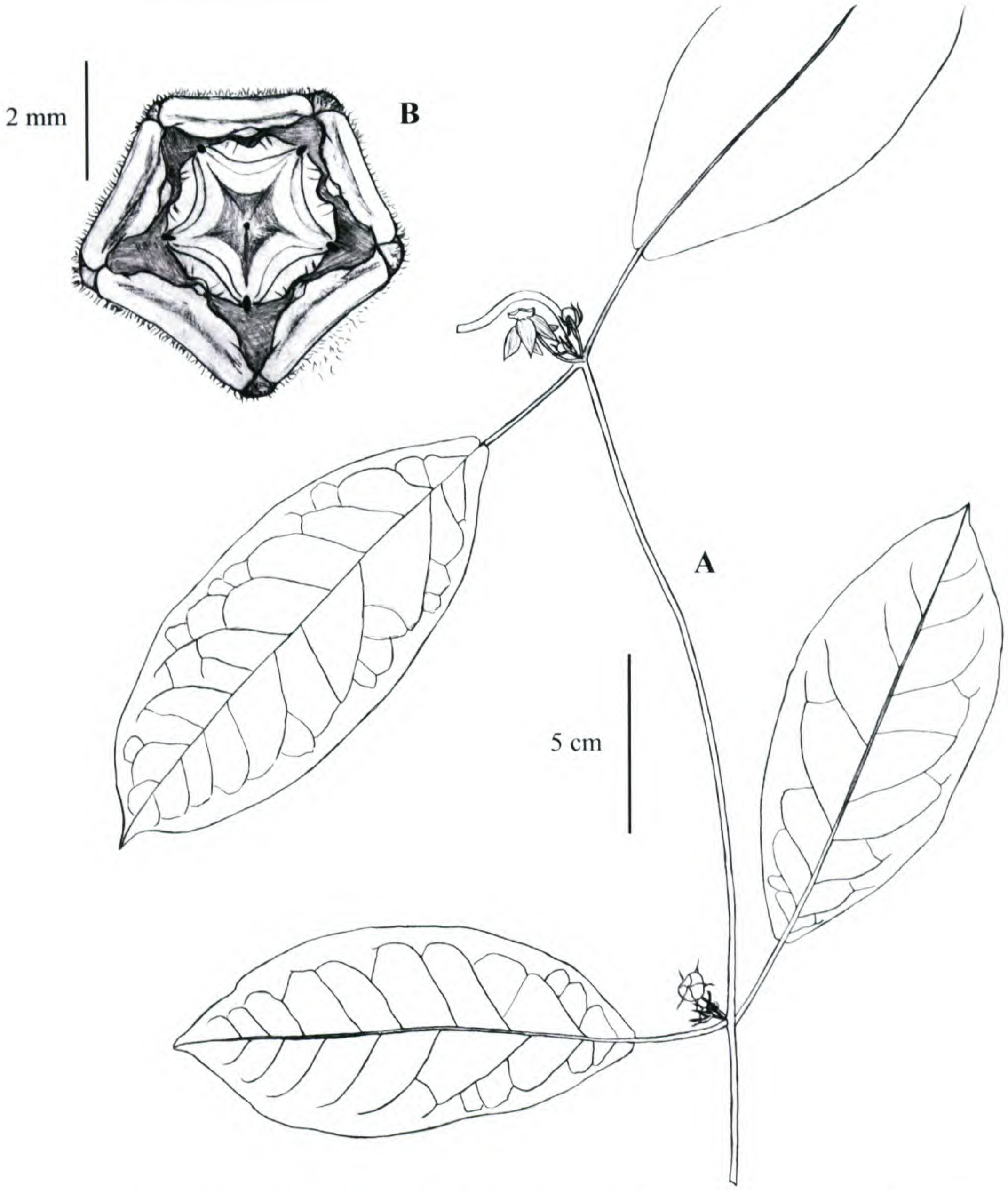


Figure 9. *Gonolobus hammelii* W. D. Stevens. —A. Flowering branch. —B. Gynostegium, corona, and faucal annulus, from above. Drawn from holotype (*Hammel & Grayum 17699*, MO).

leters 2; petiole 0.8–3 cm, with sparse and inconspicuous short and glandular hairs. Inflorescence racemiform to congested-racemiform, 3- to 12-flowered, glabrous, peduncle 23–42 mm, axis 0.2–1.3 mm, pedicel 37–61 mm, bracts 2–3 × 0.2–0.5 mm, deltate; calyx tube 0.8–1 mm long, with 1 colleter per sinus, lobes narrowly lanceolate with acute tips, 10.7–13.1 × 1.8–2 mm, green, glabrous; corolla briefly campanulate then rotate, pale green or yellow with a brown or purple tint, glabrous, tube 2.9–3 mm long, faucal annulus an erect tube, adnate to base of corona and only visible as a 5-lobed flange on corona tube, 1–1.5 mm tall, corolla lobes narrowly lanceolate, with small auricles at the sinuses, 3–40 × 3.3–4.5 mm, apparently patent; gynostegium with stipe obconical, 1.6–2.5 × 1–2 mm, 5-ribbed, corona an erect, 5-lobed, fleshy, obconical tube, 2.4–3.5 mm tall from annulus to lobe tips, 1.6–3 mm tall at sinuses, anther appendages sharply deflexed, 2-armed, the arms curved outward and upward to vertical, forming a "W" on back of anther, 1.4–1.5 × 1.4–1.8 mm in outline in natural

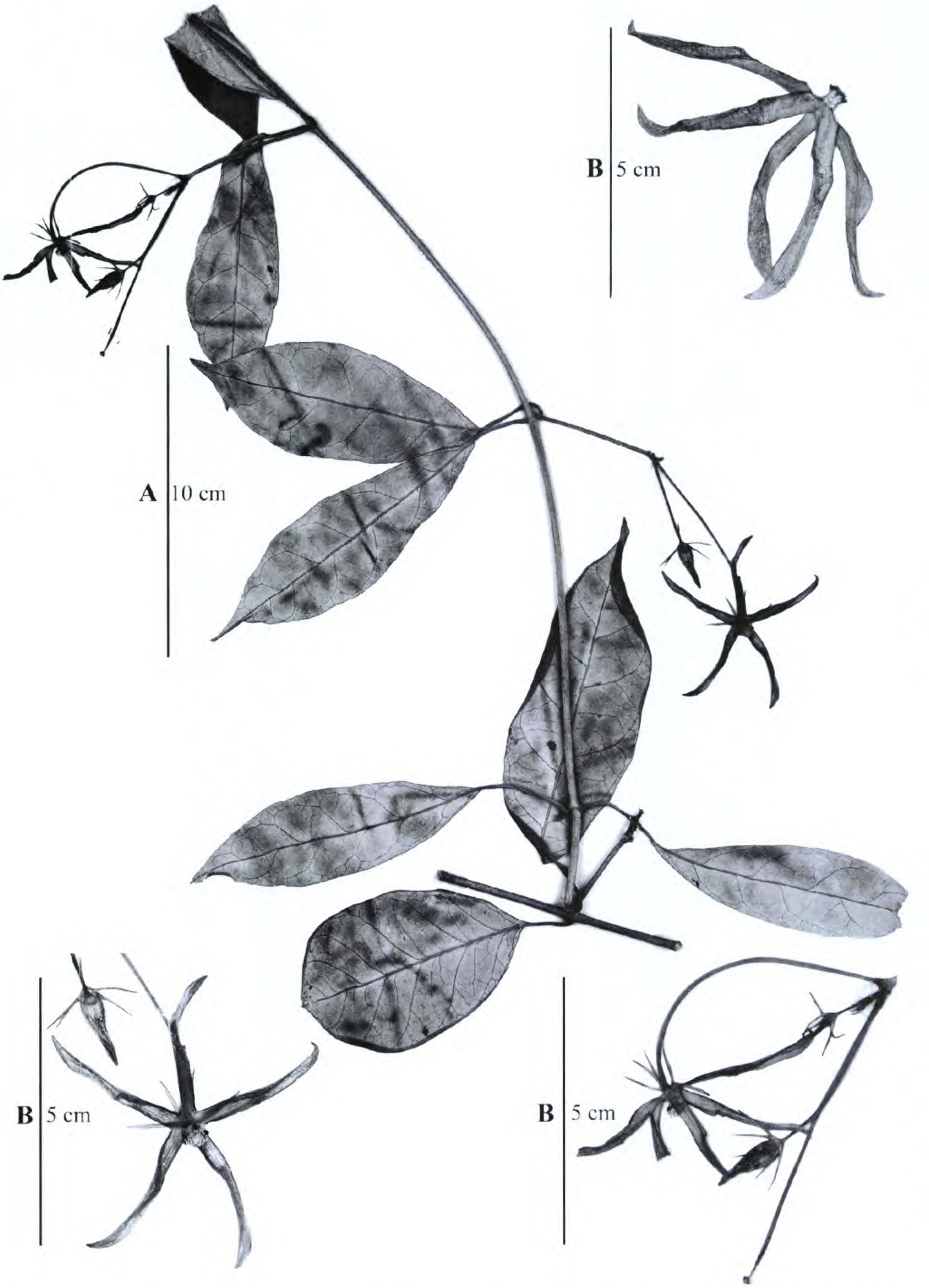


Figure 10. *Gonolobus pallidus* W. D. Stevens. —A. Scan of holotype (*Dressler 1655*, NY). —B. Close-up of flowers.

position, terminal appendages loosely overlapping margin of style apex, ca. 0.3 × 1.5 mm, apparently translucent, guide rails straight, parallel, 0.5–0.6 × 0.2–0.3 mm; corpusculum 0.34–0.36 × 0.14 mm, sagittate, dark red-brown, translators ca. 0.33 × 0.16 mm, pollinia 0.71–0.73 × 0.34–0.36 mm; style apex 2.5–3 mm wide. Fruits and seeds unknown.

The flower size and shape of this species almost

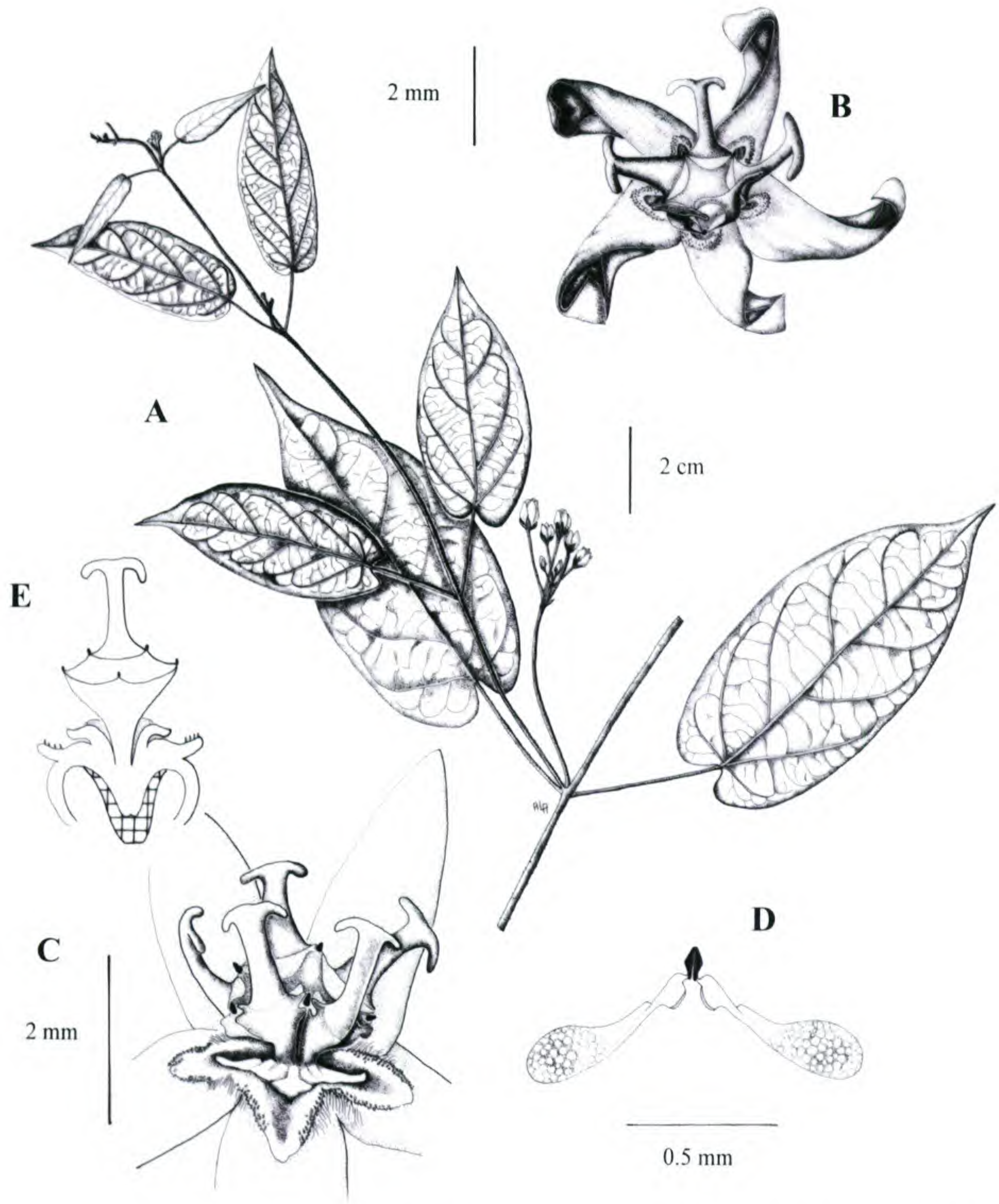


Figure 11. *Gonolobus sandersii* W. D. Stevens. —A. Flowering branch. —B. Flower, from above. —C. Flower, from side with corolla pulled back. —D. Pollinarium. —E. Diagnostic longitudinal section of flower. Drawn from *Sanders et al. 8522* (MO).

exactly match those of *Gonolobus versicolor*, but otherwise the plants are quite different and the two species are probably not closely related; *G. pallidus* differs in having pale green, bicolored leaves that lack long hairs, an entirely glabrous corolla that has flat lobes, and dorsal anther appendages that are 2-armed rather than entire. The tubular annulus almost entirely adnate to the base of the much longer tubular corona is a unique character in the genus.

Paratype. MEXICO. **Chiapas:** Mpio. La Trinitaria, 10 km ENE of Dos Lagos above Santa Elena, *D. E. Breedlove 52282* (CAS).

11. Gonolobus sandersii W. D. Stevens, sp. nov. TYPE: Mexico. Colima: Mpio. Comala, Rancho El Jabalí, around Lago Epazote, 19°26′30″N, 103°40′48″W, 1375 m, 2 Aug. 1991, *L. Vázquez V. 974* (holotype, MO; isotype, UCR). Figure 11.

Species habitu cum *Gonolobo jaliscensi* optime congruens, sed differt appendicibus dorsalibus antherarum longioribus gracilioribus.

Perennial parts unknown, young stems with simple indumentum, denser at the nodes and ± in 2 lines on internodes, hairs spreading or reflexed,

white to brown, 0.4–1.3 mm long, internodes 1–15 cm. Leaf blades elliptic, 5.7–9.9 × 1.9–4.4 cm, apex acuminate to attenuate, base lobate or rarely truncate, lobes descending to convergent, sinus to 0.6 cm deep, adaxially with sparse erect hairs 0.2–0.8 mm long, abaxially with brown glandular hairs ca. 0.1 mm long, especially on the nerves, and occasionally a few long hairs near base of midrib, lateral veins 4 to 7 pairs, middle veins 40°–50° to midrib, colleters 4 or 6; petiole 2.5–3.3 cm, with glandular hairs and often a few long hairs. Inflorescence congested-racemiform or sometimes interrupted, 1- to 20-flowered, puberulent with curly, non-glandular hairs ca. 0.1 mm long, uniformly or on 1 side, peduncle (2–)9–52 mm, axis 2–10 mm, pedicel 15–32 mm, thin and lax, bracts 1.2–2.2 × 0.2–0.6 mm, lanceolate or deltate; calyx tube 0.4–0.8 mm long, with 1 colleter per sinus, lobes deltate or ovate with acute to rounded tips, 1.4–2 × 0.9–1.3 mm, green or purple, abaxially with appressed hairs 0.1–0.15 mm long, adaxially glabrous; corolla campanulate, uniformly green, abaxially glabrous, adaxially pubescent on faucal annulus, tube, and base of lobes, hairs bright white, 0.1–0.2 mm long, hairs of outer lobes of annulus lobes curly, hairs of inner annulus lobes and corolla tube straight, tube 1.7–2.4 mm long, faucal annulus of 10 rounded lobes, lobes opposite corolla lobes erect or ascending, outer surface green and sparsely pubescent, inner surface white and densely pubescent, 1–1.6 mm long, alternate lobes sharply inflexed, white and densely pubescent, 0.4–0.9 mm long, corolla lobes elliptic with revolute margins and somewhat twisted, apex acute to rounded, 5.5–6.3 × 1.8–2.4 mm, reflexed; gynostegium with stipe 0.4–0.8 × 0.8–1.2 mm, 5-ribbed, corona fleshy, white or margin sometimes brown, bowl-shaped, 10-lobed, each lobe with a central ridge, 0.9–1.2 mm wide at lobes opposite outer annulus lobes, 0.5–0.8 mm wide at alternate lobes, base adnate to annulus, anther appendages white, ascending, with a long, thin stalk and a bifid tip, stalk 1.5–3.2 × 0.2–0.5 mm, arms divergent to coiled, tip in natural outline 0.4–1 × 0.7–1.2 mm, terminal appendages appressed to style apex, 0.15–0.3 × 0.9–1.3 mm, bright white, guide rails indistinct, vertical, 0.1–0.3 × 0.1 mm; corpusculum 0.14–0.19 × 0.06–0.08 mm, subsagittate, red-brown, translators 0.16–0.24 × 0.09–0.13 mm, pollinia 0.5–0.64 × 0.18–0.19 mm, asymmetrical; style apex 1.5–2 mm wide, red-purple. Fruits and seeds unknown.

This new species is not apparently allied to any other. It is superficially most similar to *Gonolobus jaliscensis*, especially vegetatively and in the small flowers with a strongly reflexed green corolla, and *G. sandersii* occurs at similar elevations within the range of *G. jaliscensis*, but *G. jaliscensis* is generally much more pubescent, including both sides of the corolla, has shorter and more rigid inflorescences, green-on-green reticulate corollas, and, most conspicuously, short, bilobed dorsal anther appendages. The anther appendages of *Gonolobus sandersii* are a more prominent part of the flower than any other species of *Gonolobus*, and on collectors' notes are sometimes called petals.

Paratypes. MEXICO. **Colima:** Mpio. Comala, Rancho Jabalí, S and E sides of Lago El Calabozo, *A. C. Sanders, I. Garcia R., G. Ballmer & T. Krantz 8522* (MO, UCR), *L. Vázquez V. & B. L. Phillips 889* (MO, UCR), *951* (MO, UCR), *L. Vázquez V. 1084* (MO, UCR); Mpio. Comala, Rancho Jabalí, around Lago El Epazote, *L. Vázquez V. & B. L. Phillips 725* (MO, UCR), *L. Vázquez V. 1002* (MO, UCR), *1362* (MO, UCR). **Jalisco:** Mpio. Tecalitlán, 3 km al E de Llanitos, brecha a Canutillo, *J. Villa C. & S. D. Koch 777* (CHAPA, MO).

12. Gonolobus truncatifolius W. D. Stevens, sp. nov. TYPE: Costa Rica. Limón: Cordillera de Talamanca, Atlantic slope, Valle de Silencio, just N of Cerro Hoffman, 4.5 airline km W of Panama border, 9°08′N, 82°58′W, 2350–2450 m, 8 Sep. 1984, *G. Davidse, G. Herrera C. & M. H. Grayum 28625* (holotype, MO; isotype, CR). Figure 12.

Gonolobo chiriquensi proxima forma et amplitudine florum foliorumque sed differt praesertim indumento prominenti et nervis secundariis foliorum paucioribus.

Perennial parts unknown, young stems with dense simple or mixed indumentum, long hairs 0.5–2 mm long, pale yellow, reflexed to nearly patent, short hairs, when present, ca. 0.1 mm long, internodes 1–19 cm. Leaf blades elliptic or somewhat ovate or obovate, 6.3–10 × 2.6–5 cm, apex acuminate to attenuate, base rounded to truncate, pilose adaxially with hairs 0.4–1.5 mm long, midrib sometimes with short hairs, pilose or pilosulose abaxially with hairs 0.1–1.5 mm long, lateral veins 5 to 6 pairs, middle veins 40°–60° to midrib, colleters 2, long and thin and often with dark bases and light tips; petiole 1.5–3.9 cm, pilose, hairs antrorse. Inflorescence congested-racemiform, 2- to 4-flowered, with simple or mixed indumentum, peduncle 3–17 mm, axis ca. 0.2 mm, pedicel 5–18 mm, bracts 1.2–5 × 0.4–1 mm, lanceolate; calyx tube 0.5–1.5 mm long, with 0 to 2 colleters per sinus, lobes lanceolate to elliptic with acute tips, 6–7.8 × 2.2–3.3 mm, green, adaxially glabrous, abaxially pilosulose with hairs erect to appressed, 0.1–0.5 mm long; corolla rotate, purple or green

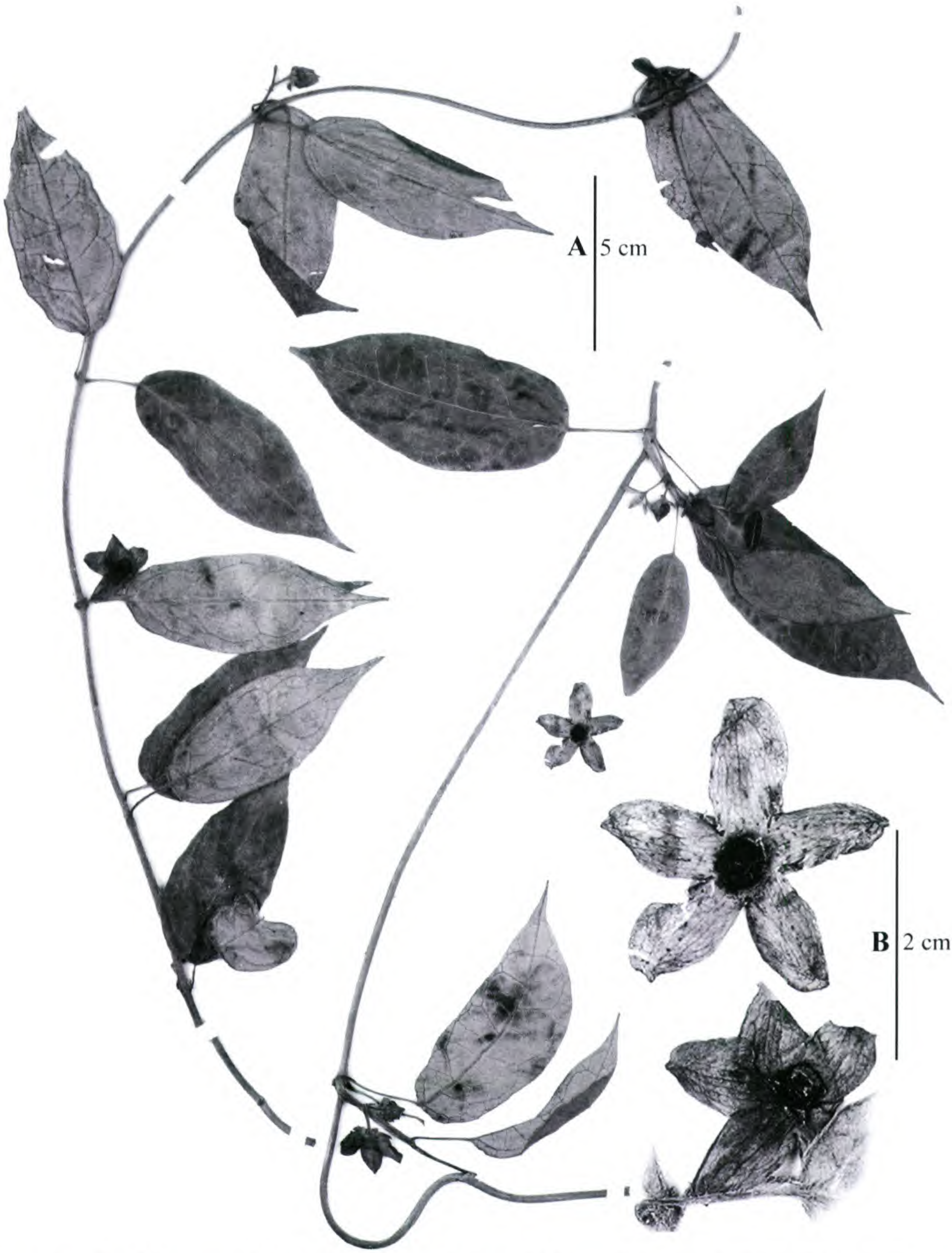


Figure 12. *Gonolobus truncatifolius* W. D. Stevens. —A. Scan of holotype (*Davidse et al. 28625*, MO). —B. Close-up of flowers.

with brown veins, abaxially pilosulose with hairs appressed to erect, 0.2–0.5 mm long, adaxially the tube, surface of annulus, and one margin of each lobe with curly white hairs 0.05–0.1 mm long, tube 2–3 mm long, faucal annulus an erect lip, 0.2–0.3 mm tall, upper margin without distinct hairs, lobes asymmetrically elliptic with asymmetrically obtuse tips, 9–12 × 7–8.4 mm, patent; gynostegium with stipe 0.3–0.5 × 1–1.3 mm, 5-ribbed, corona a 5-lobed disk, fleshy and deeply rugose, each lobe

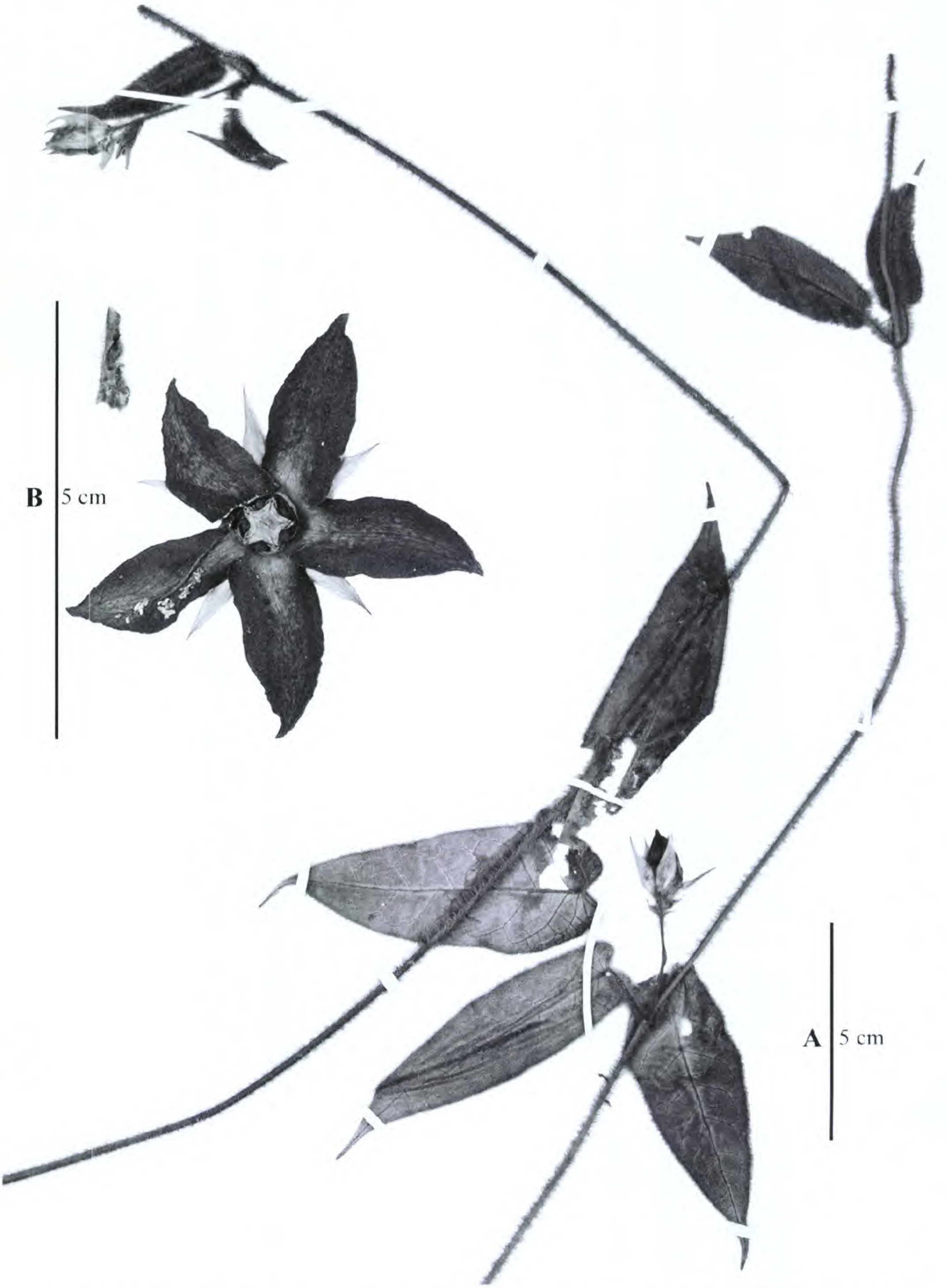


Figure 13. *Gonolobus ustulatus* W. D. Stevens. —A. Scan of holotype (*Gómez 11413*, F). —B. Close-up of flowers.

somewhat cucullate and retuse at tip, outer margin deeply striate, 1.4–2.5 mm wide at lobes, 1.1–2 mm wide at sinuses, anther appendages deflexed, with a broad, rounded base and an obdeltate tip, apex shallowly 3-lobed to shallowly crenulate, 0.7–0.9 mm long, 0.9–1.3 mm wide at tip, somewhat fleshy, terminal appendages tightly appressed to style apex, 0.2–0.5 × 2–2.2 mm, brown, guide rails straight, parallel, indistinct, nearly vertical, ca. 0.2 × 0.1 mm; corpusculum 0.26–0.3 × 0.1–0.15 mm,

sagittate, red-brown to nearly black, with a hooked tip, translators 0.24–0.25 × 0.14–0.15 mm, pollinia 0.83–0.94 × 0.31–0.34 mm, sigmoidially obovate; style apex 3–3.3 mm wide. Immature follicles fusiform, apex acute, base narrowed, at a right angle to follicle body, ca. 9.5 × 2.5 cm, with 5 complete wings ca. 5 mm wide, glabrous, glaucous; seeds unknown.

This new species is clearly closest to *Gonolobus chiriquensis* Woodson, found in similar habitats in Costa Rica and Panama. The two share generally similar leaf size and shape, especially the more or less truncate leaf bases, and generally similar flower size and shape, especially the short, broad, strongly asymmetrical corolla lobes that are reminiscent of many species of *Matelea* Aublet. There are, however, a number of striking differences. *Gonolobus chiriquensis* is practically glabrous on all parts while *G. truncatiflorus* is conspicuously villose, notably including the outside of the corolla, the new species has 5 to 6 secondary leaf veins (vs. 8 to 14), and the style apex is 3–3.3 mm in diameter (vs. 1.6–2 mm). The corona of *Gonolobus truncatifolius* is much more massive and produces a white mucilage when soaked in water, perhaps indicating that it is secreting something other than nectar and a phenomenon not seen in other species.

This is a cloud forest species known from 1500 to 2750 m, among the highest elevations known for *Gonolobus*. It is known to flower in July, September, and December, and the immature fruits were collected in September.

Paratypes. COSTA RICA. **Heredia:** P. N. Braulio Carillo, de la Est. Barva 1 km hacia Laguna Barva, *G. Rivera 409* (INB, MO). **Puntarenas:** R. I. Ujarrás, R. B. Dúrika, *Q. Jiménez & R. Aguilar 1946* (INB, MO). **San José:** P. N. Chirripó, camino a Chirripó, *E. Alfaro 989* (INB, MO).

13. Gonolobus ustulatus W. D. Stevens, sp. nov. TYPE: Costa Rica. Alajuela: R. F. San Ramón, 10°13′N, 84°37′W, 900–1200 m, 12–15 Mar. 1987, *J. Gómez L. 11413* (holotype, F). Figure 13.

Gonolobo leiantho maxime similis sed caulibus foliis inflorescentiis ferrugineis pilosis lobis calyces longioribus angustioribus corollis intra tantum papillatis.

Perennial parts unknown, young stems with dense mixed indumentum, long hairs 2–2.5 mm long, brown, short and glandular hairs ca. 0.1 mm long, internodes 22–25 cm. Leaf blades narrowly elliptic to ovate, 7–8 × 2.3–3 cm, apex attenuate, base lobate, lobes descending, sinus 0.3–0.4 cm deep, pilose with brown hairs 1–1.5 mm long, lateral veins 10 to 12 pairs, middle veins ca. 60° to midrib, colleters 2, with dark bases and light tips; petiole 1.4–2 cm, with mixed indumentum. Inflorescence congested-racemiform, 2-flowered, with mixed indumentum, peduncle 22–25 mm, pedicel (immature) 3–8 mm, bracts 3.6–8 × 0.8–1 mm, lanceolate; calyx tube ca. 0.8 mm long, with 1 colleter per sinus, lobes lanceolate with acute tips, 14–15 × 3.2–3.4 mm, green, adaxially glabrous, abaxially with mixed indumentum, long hairs brown, erect, 1–1.5 mm long; corolla rotate, green, reticulate, abaxially glabrous or with a few hairs at tips of lobes, adaxially with tube and a broad band along one margin of each lobe papillate, tube ca. 5 mm long, faucal annulus a thin, erect lip, ca. 0.3 mm tall at lobes, 0.1 mm tall at sinuses, hispidulose with white hairs ca. 0.1 mm long, corolla lobes narrowly asymmetrically elliptic with asymmetrically acute tips, with inconspicuous auricles at the sinuses, 20–21 × 9–10 mm, patent; gynostegium with stipe ca. 1 × 1.5 mm, 5-winged, corona a 5-lobed disk, the 5 wings of the stipe continuing as radii on the corona, ca. 3.5 mm wide, papillate, outer margin vertically striate, anther appendages slightly deflexed, asymmetrically reniform, ca. 1.4 × 2.3 mm in outline, fleshy, brown, terminal appendages tightly appressed to style apex, ca. 0.3 × 3.2 mm, translucent white, guide rails straight, parallel, indistinct, tilted under style apex, ca. 0.2 × 0.1 mm; corpusculum ca. 0.43 × 0.18 mm, sagittate, dark red-brown, with a hooked tip, translators ca. 0.34 × 0.24 mm, pollinia ca. 1.66 × 0.48 mm, ± symmetrical, fertile (distal) body with a distinct longitudinal ridge on one face; style apex ca. 4.5 mm wide, green. Fruits and seeds unknown.

In technical characters, this imperfectly known new species is probably closest to *Gonolobus leianthus* Donnell Smith, a species ranging from southern Mexico to northern Nicaragua, but is quite different in general appearance because all parts except the flowers are covered with long brown hairs. Additionally, the new species can be recognized by having narrower leaves with more secondary veins, longer and narrower calyx lobes, corolla lobes merely papillate and lacking a white callus, and a papillate corona.

14. Gonolobus variabilis W. D. Stevens, sp. nov. TYPE: Costa Rica. Puntarenas: NE slope of Fila de Cal, along road between San Vito de Coto Brus and Ciudad Neily, 8°41′00″N, 82°56′30″W, 620 m, 7 Mar. 1987, *M. H. Grayum & C. Fleming 8118* (holotype, MO). Figure 14.

Figure 14. *Gonolobus variabilis* W. D. Stevens. —A. Scan of holotype (*Grayum & Fleming 8118*, MO). —B. Close-up of flowers.

A *Gonolobo albomarginato* floribus minoribus trichomatibus corollae extus intusque brevioribus, a *G. eduli* corolla atrovirenti callis loborum corollarum trichomatibus corollae extus longioribus trichomatibus corollae intus brevioribus recedit.

Perennial parts unknown, young stems with dense mixed indumentum, somewhat organized into 2 lines in internodes, long hairs 1–2.5 mm long, yellow to brown, short and glandular hairs 0.1–0.2

mm long, internodes 3–18 cm. Leaf blades elliptic to ovate, 8.5–13.5 × 4.6–8.4 cm, apex acuminate to attenuate, base lobate, lobes descending to overlapping, sinus 1–2 cm deep, sparsely pilose adaxially with hairs 0.3–1 mm long, midrib also with short and glandular hairs, abaxially with mixed indumentum, long hairs 0.2–1 mm long, lateral veins 6 to 8 pairs, middle veins 35°–50° to midrib, colleters 2 to 6, often with dark bases and light tips; petiole 2.9–7.7 cm, with mixed indumentum. Inflorescence congested-racemiform, 2- to 10-flowered, with mixed indumentum, peduncle 6–30 mm, axis 0.1–0.6 mm, pedicel 15–45 mm, bracts 0.7–5.6 × 0.2–0.7 mm, linear; calyx tube 0.7–1 mm long, with 1 colleter per sinus, lobes lanceolate with acute tips, 5.3–6 × 1.2–2 mm, green with purple tint, adaxially glabrous or with a few hairs on distal midrib, abaxially with mixed indumentum, long hairs erect, 0.4–0.8 mm long; corolla briefly campanulate and then rotate, green, abaxially with sparse to dense, simple or mixed indumentum, long hairs 0.2–1 mm long, adaxially with tube and proximal third to half of lobes hispidulose or papillate with white hairs to 0.05 mm long and with a band of curly white hairs 0.2–0.4 mm long immediately along white callus of lobes, tube 1.5–2 mm long, faucal annulus erect, 0.5–1 mm tall, hispidulose with white hairs 0.2–0.4 mm long, lobes narrowly lanceolate or elliptic with acute tips, with conspicuous auricles at the sinuses, one margin of each lobe with a thick, bright white callus, 9–14.1 × 3.1–4.8 mm, patent; gynostegium with stipe 1–1.5 × 0.7–1.8 mm, 5-winged, corona a 5-lobed, fluted bowl, the 5 wings of the stipe continuing as radii on the corona and forming 5 chambers, 0.8–1.8 mm tall at lobes, 0.5–1.4 mm tall at sinuses, anther appendages deflexed, reniform to nearly spathulate, with the broad apex shallowly crenulate, 1.2–2.4 × 1.8–2.5 mm in outline, fleshy, pale yellow to pale pink, terminal appendages tightly appressed to style apex, 0.1–0.2 × 1.8–2.4 mm, white to pale brown or purple, guide rails straight, parallel, indistinct to prominent, vertical to tilted under style apex, 0.1–0.7 × 0.1–0.2 mm; corpusculum 0.26–0.33 × 0.1–0.11 mm, sagittate, brown or red-brown, with a hooked tip, translators 0.31–0.39 × 0.18–0.19 mm, pollinia 1.05–1.38 × 0.36–0.46 mm, fertile (distal) body distinctly flattened or concave on one face; style apex 2.6–4 mm wide, pale yellow. Fruits and seeds unknown.

While this species is easily characterized by a series of characters, especially the indumentum of the corolla, and unlike any other known *Gonolobus*, it is at the same time curiously variable. Two of the collections have long peduncles and two short, three have the outside of the corolla with a dense mixed indumentum while one has only scattered long hairs, three have pale yellow dorsal anther appendages and in one they are pale pink, two have distinctly larger style apices, and three have normal, indistinct, 0.1–0.2 mm long guide rails under the style apex and one has prominent, nearly vertical guide rails about 0.7 mm long. One could invent this species by combining characters from *Gonolobus albomarginatus* (Pittier) Woodson, *G. edulis* Hemsley, and *G. heterophyllus* (Hemsley) W. D. Stevens, and perhaps hybridization has been involved, but the four known collections are temporally and geographically separated and easily recognized. *Gonolobus albomarginatus*, *G. taylorianus* W. D. Stevens & Montiel, and *G. fraternus* Schlechtendal, among Mesoamerican species, are at least equally variable.

This is a cloud forest species known from 620 to 1300 m and is known to flower between November and March.

Paratypes. COSTA RICA. **Alajuela:** R. B. Monteverde, Peñas Blancas, *W. Haber & E. Bello 6535* (MO); La Peña, *A. Smith P2154* (MO). **San José:** Río Claro valley below La Palma NE of San Jerónimo, *W. C. Burger & R. L. Liesner 6260* (F).

Acknowledgments. Alba Arbeláez prepared the line drawings and Fred Keusenkothen and Sandra Arango prepared the specimen scans. Stephen Koch (CHAPA) and Andrew Sanders (UCR) made a special effort to provide interesting specimens. Olga Martha Montiel, Victoria Hollowell, and Neil Harriman made significant improvements to the original manuscript.

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A New Genus and Two New Species of Ferns from Vietnam

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ABSTRACT. The new genus *Kontumia* (Polypodiaceae?) and its type species *Kontumia heterophylla* from Vietnam are described and illustrated. *Kontumia* is distinguished from *Gymnogrammitis* by its scandent habit, dimorphic leaves, clathrate transparent scales on the rhizome and petiole bases, and aspects of leaf morphology. Also, a new species of *Cyrtomium* from Vietnam is described and named as *C. elongatum* (Dryopteridaceae). *Cyrtomium elongatum* is similar to *C. wulingense* S. F. Wu, but differs by its longer leaves (to 90 cm) and more numerous pinnae (more than 60 pairs) with cordate rather than oblique bases, abaxially with sparse small brown scales, and with brown punctations within the areoles.

Key words: *Cyrtomium*, Dryopteridaceae, fern, *Kontumia*, Vietnam.

Because of its inaccessibility and steep terrain, about two-thirds of the montane areas with rich plant diversity in Vietnam have not been fully explored and studied. According to a recent summary (Phan, 1998), there are 291 families, 2010 genera, and 9628 plant species recorded for Vietnam. It is estimated that only 80% of the country's plants have been described so far (Averyanov et al., 2000; T. H. Nguyen et al., 2000; Phan et al., 2002). For instance, 676 species of pteridophytes were described in the *Flore Générale de l'Indo-Chine* (Tardieu-Blot & Christensen, 1939–1951). However, at least 776 pteridophyte species have been recorded more recently (Pham, 1991), and a new genus of fern, *Caobangia* A. R. Smith & X. C. Zhang, was described in 2002 (Smith & Zhang, 2002). In 2002, during a trip by the first author to northern Vietnam, a number of specimens were examined at HN, these collected by Phan Ke Loc and others. In 2003, the authors jointly visited central and northern portions of Vietnam again to collect additional fern specimens. From our survey and examination, one new genus and two new species are described below.

Kontumia heterophylla S. K. Wu & L. K. Phan, gen. et sp. nov. TYPE: Vietnam. Kon Tum Prov.: Kon Plong Distr., Ngoc Tem Municipality, Mang La State Forest, ca. 14°41′41″N, 108°22′21″E, ca. 1100 m, 9 Apr. 2000, *Phan Ke Loc P-10551* (holotype, HN; isotypes, KUN, LE, MO). Figures 1, 2.

Genus novum valde insigne probabiliter affine *Gymnogrammitis*, a qua differt fronde sterili a fertili valde diversa, paleis rhizomatis et stipitis basis translucide clathratis, stipite frondis sterilis anguste alato, lamina crasse membranacea, venis elevatis; fronde fertili fronde sterili longiore, stipite tereti, utrinque sine alato, lamina tenuiter tripinnatifida, segmento ultimo tenuiter lineari vix 1 mm lato, apice latiore, obtuso, vena singulari ad marginem non attingenti; soris orbicularibus, apicem nervorum occupantibus.

Fern. Stem long scandent, cylindric, with dictyostele, densely covered with scales; scales 1 cm × 1 mm, lanceolate, acuminate at apex, margins sparsely denticulate, transparent clathrate, base peltate. Leaves dimorphic, approximately or remotely and spirally arranged, sterile leaves shorter, ca. ½ the length of fertile ones; petiole terete, stramineous, inconspicuously articulated. Petiole of sterile leaves to 10 cm long, ca. 2 mm diam., narrowly winged on each side, glabrous; lamina oblong-lanceolate, ca. 15 cm long, middle 5–8 cm wide, obtuse at apex, truncate at base, bipinnatipartite, crassimembranous; veins pinnate, simple in

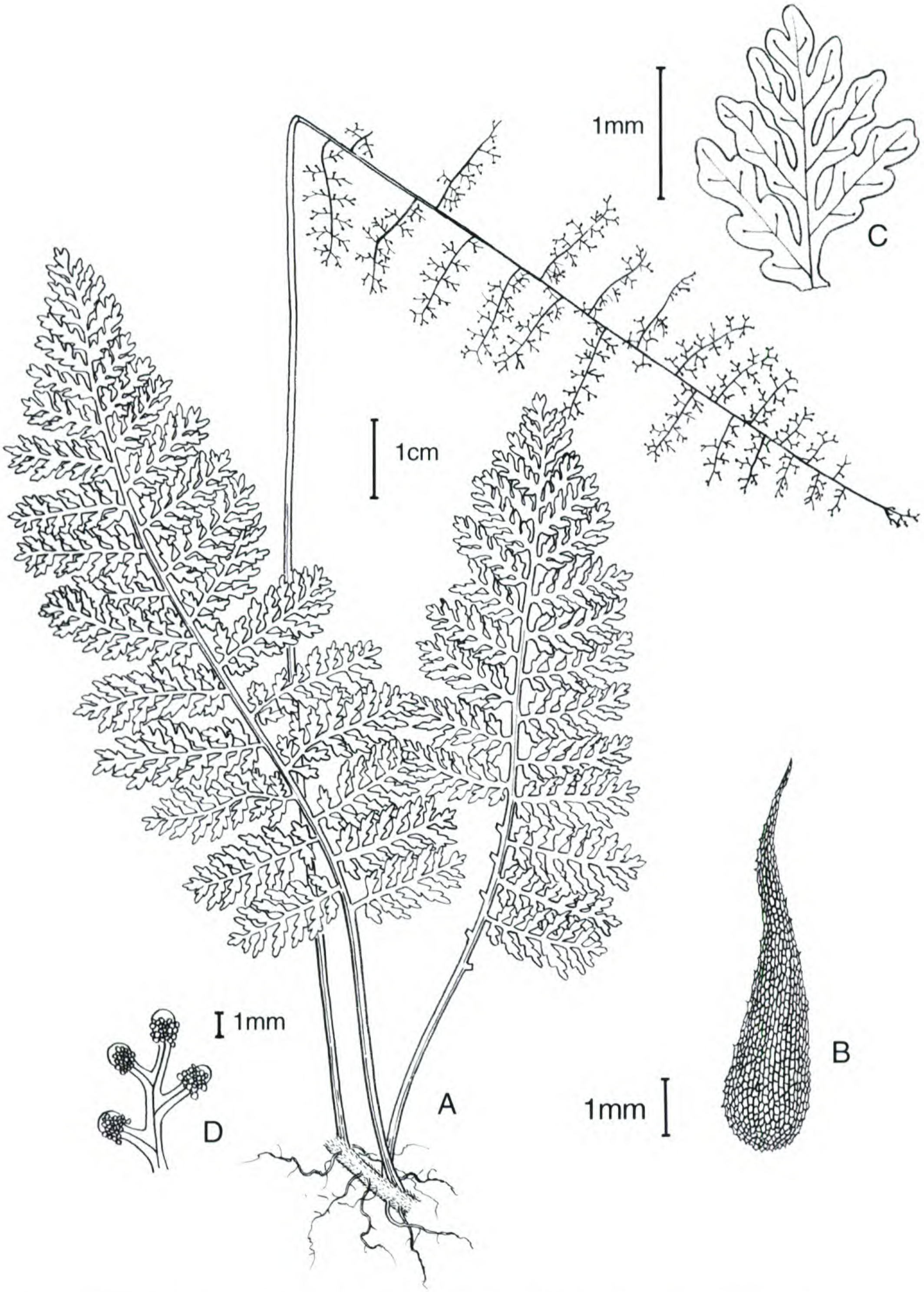


Figure 1. *Kontumia heterophylla* S. K.Wu & L. K. Phan. —A. Plant with fertile leaf. —B. Scale of rhizome. —C. Part of fertile pinna. —D. Part of sterile pinna. Drawn from the holotype and the KUN isotype.

each pinnule, not reaching the margin; primary pinnae 10 to 15 pairs, spreading, alternate, oblong-lanceolate, ca. 4 × 1.5 cm, obtuse at apex, cuneate at base, short-stalked, secondary pinnules lorate, 1 cm long, ca. 2 mm wide, obtuse at apex, margin lobed, primary and secondary rachises glabrous, winged. Petiole of fertile leaves to 26 cm long, 2 mm diam., both sides wingless, glabrous; lamina to

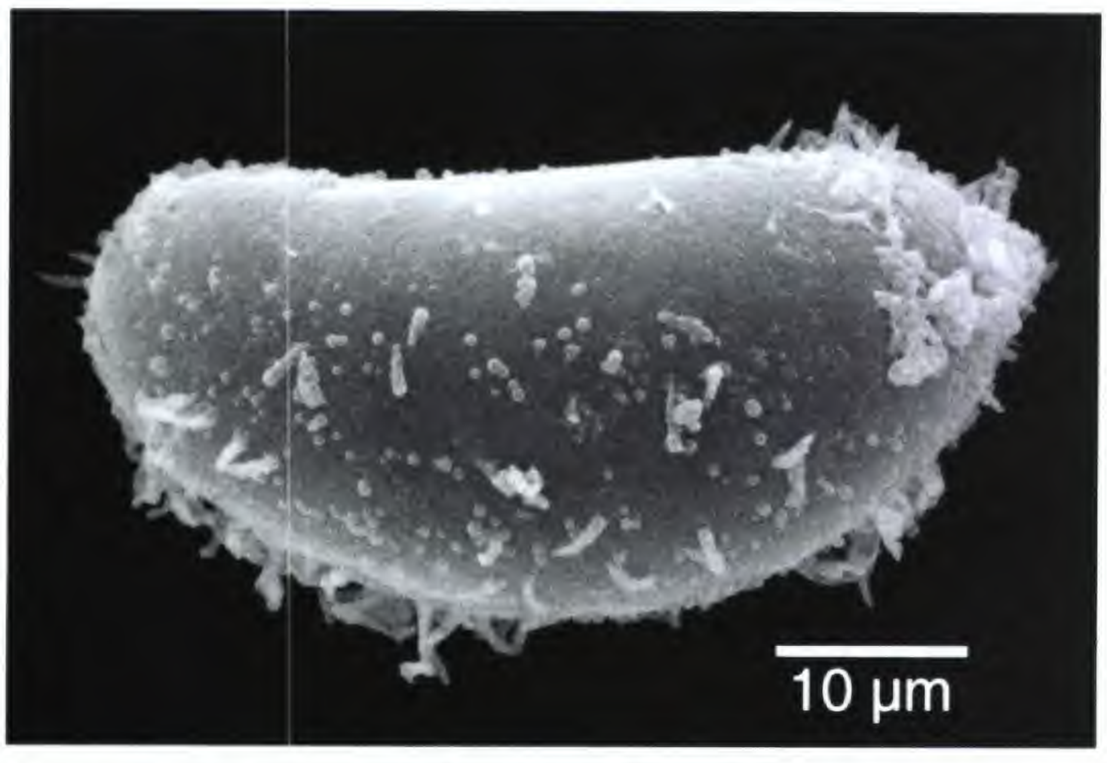


Figure 2. Scanning electron micrograph of a spore of *Kontumia heterophylla* (taken from *Wu et al. WP-135*).

18 cm long, 5 cm wide, tripinnatifid, segments linear, less than 1 mm wide, ultimate pinnae apex broader, obtuse, primary and secondary rachis wingless. Sori orbicular, terminal on the veinlets, exindusiate, with 15 to 18 sporangia, lacking paraphyses. Spores 64 per sporangium, 45–65 μm in longest dimension, ellipsoidal, the thin perispore with irregular spines, rods, and globules.

Habitat and ecology. This species is found in the primary closed evergreen tropical seasonal broad-leaved submontane forest on upper slopes of sandstone and gneiss mountains, sometimes in submontane coniferous forest on ridges dominated by *Fokienia hodginsii* (Dunn) A. Henry & H. H. Thomas or *Dacrydium elatum* (Roxburgh) Wallich ex Hooker. The forest ground frequently has deep soil rich in humus; rock outcrops were rare.

The habitat of *Kontumia heterophylla* is found on the summits of the southern Truong Son range. Due to its unique geographic location, the rains from both southwestern and northeastern monsoons prevail in this area, which result in a locally humid climate. By referring to the climatological data of neighboring stations of the southern Truong Son range, such as Ba To and Gia Vuc in Quang Ngai Province on the eastern slope and Kon Tum and Dac To in Kon Tum Province on the western slope (K. V. Nguyen et al., 2000), we estimate that the mean annual precipitation at the type locality is at least 2500 mm, with at most two dry months. Mean annual temperature is about 21°C; the normal temperature is above 17°C.

Kontumia is an unusual genus. It seems closely related to *Gymnogrammitis* Griffith, which has traditionally been accepted as a member of Davalliaceae (Kramer, 1990). However, Ching (1966) placed *Gymnogrammitis* in an independent family, Gymnogrammitidaceae, and suggested its possible affinities to Polypodiaceae. According to analysis of the combined data sets of the chloroplast genes *rbc*L and *rps*4, Schneider et al. (2002) demonstrated that *Gymnogrammitis* belongs to the polygrammoid clade of Polypodiaceae, not Davalliaceae. The monolete spores (Fig. 2) of *Kontumia* with the thin perispore beset irregularly with globules and spines and/or rods (some degraded) are quite similar to those of some species of Polypodiaceae and those of *Gymnogrammitis* (as illustrated by Tryon & Lugardon, 1991), but different from those found in Davalliaceae.

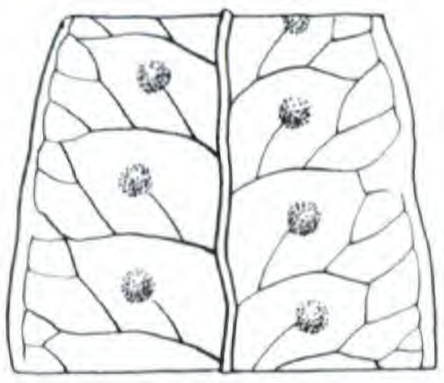
The new genus we describe here has a scandent habit, dimorphic leaves, the scales of the rhizomes and petiole bases clathrate, the petiole of sterile leaves with narrow wings, lamina crassimembranous, with elevated veins. The fertile leaves are longer than the sterile ones, with a terete petiole, wingless tripinnate lamina, linear ultimate pinnules less than 1 mm wide, apex broader, obtuse, and a single veinlet in each pinnule not reaching the margin. The sori are orbicular, terminal on the veinlets but not dorsal, and thus are very different from those of *Gymnogrammitis*. More detailed studies on the systematic position of these ferns are needed in the future.

Paratypes. VIETNAM. **Kon Tum Prov.:** Kon Plong Distr., Hieu Municipality, Mang La forest enterprise, 14°39′N, 108°25′E, 1000–1200 m, primary evergreen broad-leaved wet forest on steep mountain slopes on sandstone and gneiss, 15 Apr. 2000, *Averyanov et al. VH-5129* (HN, LE, MO); Kon Plong Distr., Hieu Municipality, 14°41′48″N, 108°22′23″E, ca. 1250 m, 20 Nov. 2003, *Wu et al. WP-136* (HN, KUN, MO); Kon Plong Distr., Po E Municipality, first village, 14°43′16″N, 108°38′18″E, ca. 1200 m, logged primary closed evergreen seasonal tropical broad-leaved submontane forests on slope of mountains, 22 Nov. 2003, *Wu et al. WP-201* (HN, KUN, MO).

Cyrtomium elongatum S. K. Wu & L. K. Phan, sp. nov. TYPE: Vietnam. Cao Bang Prov.: Nguyen Binh Distr., Yen Lac Municipality, ca. 22°44′N, 105°50′E, ca. 1300 m, *Phan Ke Loc et al. CBL-1586* (holotype, HN; isotypes, KUN, MO). Figure 3.

Species in genere *Cyrtomio* valde insignis, affinis *C. wulingensi*, sed plantis ad 90 cm altis, pinnis plus quam 60-jugis, pinna basi cordata non obliqua, supra glabra subtus paleis brunneis sparse obtecta, in areola punctis brunneis differt.

Plant to 90 cm tall. Petiole 30 cm long, base 4 cm diam., brown or stramineous, adaxially grooved, abaxially densely covered in brown linear-subulate denticulate scales. Leaves lanceolate, ca. 60 cm long, ca. 4.5 cm broad at mid-point, acuminate at apex, base gradually narrow, simply pinnate, coriaceous; pinnae ca. 62 pairs, alternate or suboppos-



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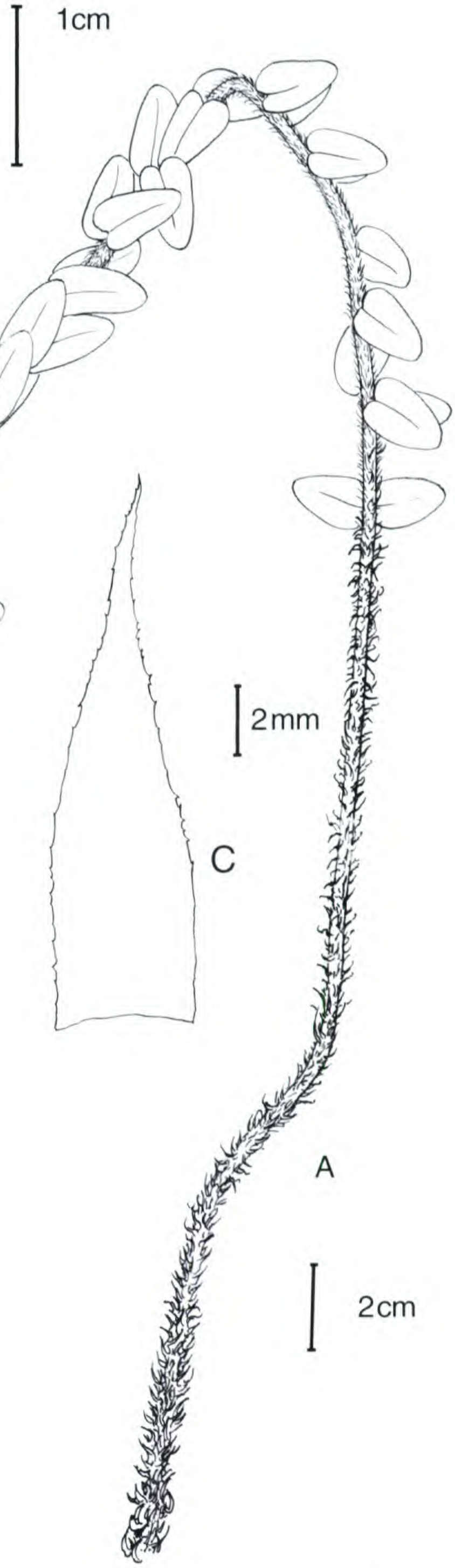

Figure 3. *Cyrtomium elongatum* S. K. Wu & L. K. Phan. —A. Plant with fertile leaf. —B. Part of pinna. —C. Scale from lower portion of stipe. Drawn from the holotype and the KUN isotype.

ite, approximate to each other; upper middle pinnae spreading-lanceolate, 2.2 × 1.2 cm, the basal pairs 1.5 × 1 cm, smaller than others, deflexed from rachis, obtuse at apex, cordate at base, entire on the margin, abaxially sparsely with small brown scales, brown punctations within areoles. Veins pinnate-forked, inconspicuous adaxially, slightly elevated abaxially; costa adaxially immersed, abaxially ele-

vated; lateral veins joining on each side of costa into 2 serial areoles. Rachis terete, adaxially grooved, sparsely covered with linear small brownish scales. Sori orbicular, attached along a line on each side of costa; indusium caducous, with ca. 35 sporangia. Spores ellipsoidal with prominent tubercles.

Cyrtomium elongatum is similar to the Chinese species *C. wulingense* S. F. Wu, which was described from western Hunan Province, but differs by the plant to 90 cm tall with more than 60 pinna pairs, the pinnae cordate at the base (not oblique), the sparse small brown abaxial pinna scales, and the brown punctations in the areoles of the veins.

Habitat and ecology. This species occurs on vertical cliffs of a north-facing, shaded limestone ridge. This karst region is dominated by relatively dry, species-rich, primary evergreen coniferous forest on peaks and ridge tops or less commonly by rather open forests. The floor of these forests is a tangle of rocks, crevices, small cliffs, and plants.

Acknowledgments. We are grateful to G. Yatskievych of the Missouri Botanical Garden for the SEM photo of spores and his valuable suggestions on the manuscript. We are also indebted to M. Veith and the electron microscopy facility at Washington University, St. Louis. The field survey and research were funded by the U.S. National Geographic Society, grant numbers 6300-98 and 7512-03. We express our sincerest gratitude for these grants. Special thanks are extended to Nguyen Tien Hiep, S. L. Averyanov, and Yang Yongping for their great support and help. We thank J. K. Yang for the illustrations (Figs. 1 and 3).

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Lectotypifications in the Genus *Andropogon* (Poaceae)

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Abstract. During a taxonomic revision of the Brazilian species of *Andropogon*, the need for lectotypification of the following names became apparent: *Andropogon arenarius* Hackel f. *subcompletus* Hackel, *Andropogon bicornis* L. var. *gracillimus* Hackel, *Andropogon carinatus* Nees, *Andropogon carinatus* var. *leiophyllus* Hackel, *Andropogon hypogynus* Hackel, *Andropogon ingratus* Hackel, *Andropogon palustris* Pilger, and *Andropogon selloanus* (Hackel) Hackel.

Key words: *Andropogon*, lectotypification, Poaceae.

Of approximately 100 species of *Andropogon* L. (Clayton & Renvoize, 1986), 28 occur in Brazil (Zanin, 2001). Lectotypes are designated here for eight names related to some of these taxa. The lectotypifications were necessary because: the holotypes were destroyed, several syntypes were mentioned in the protologue, no holotype was selected from the isotypes of the only collection number cited by the author, or only the locality of collection was cited in the protologue.

For the designation of the lectotypes the best preserved specimens that fit the original description were chosen. Further, specimens that had clear indication to have been studied by the author of the species, for instance with notes in the author's handwriting, or preserved in the herbaria where the author worked or where his main collections are deposited, were considered.

Andropogon arenarius Hackel, Flora 68(8): 134. 1885. TYPE: Uruguay. Montevideo: arenales da Costa, s.d., *Arechavaleta 204* (holotype, W; isotypes, G, K).

Andropogon arenarius Hackel f. *subcompletus* Hackel, in Lindman, Kongl. Svenska Vetenskapsakad. Handl. 346: 6. 1900. TYPE: "Brasiliae austr., Rio Grande do Sul, Ilha dos Marinheiros prope oppidium Rio Grande, in collibus arenae profunda," s.d., *C. A. M. Lindman*, Exp. I. Regnell. *A. 699* (lectotype, designated here, S; isotypes, S, W).

Hackel (1900: 6) mentioned "C. A. M. Lindman, Exp. Regnell. A. 699" in the protologue. One specimen at W, with label data slightly different from the protologue, and two specimens at S, where the Regnellian collection is preserved, were found. The three specimens are well preserved and are identified by Hackel's own handwriting. The lectotype was chosen from the two S specimens whose label data are the same as that cited in the protologue.

Andropogon bicornis L., Sp. Pl. 1046. 1753. TYPE: "Porto Rico, Mayagüez, between Monte Mesa and the sea," 27 Oct., *A. Chase 247* (typ. cons. MO, not seen).

Andropogon bicornis L. var. *gracillimus* Hackel, in Martius & Eichler, Fl. Bras. 2(3): 285. 1883. TYPE: "In Paraguay, Lamboré pr. Assumpcion, *Balansa n. 271*, a. 1874" (lectotype, designated here, W; isotypes, G [3], K).

Two collections were mentioned in the protologue, *Mosén*, from Brazil, and *Balansa 271*, from Paraguay. Five specimens of *Balansa 271* were found, one at W, three at G, and one at K. Of these, the one from W, where most of the specimens Hackel studied are deposited, is the best preserved and the only one identified by him. This specimen is chosen as the lectotype. One specimen of *Mosén* was found at W and was also identified by Hackel, but it is not as well preserved.

Andropogon carinatus Nees, Agrostologia Brasiliensis, in Mart., Fl. Bras. Enum. Pl. 2(1): 330. 1829. TYPE: "Brasilia, *Sellow*" (lectotype, designated here, K).

Andropogon carinatus var. *leiophyllus* Hackel, in A. DC. & DC., Monogr. Phan. 6: 434. 1889. TYPE: "Bra-

silia, Prov. Minas Gerais," *Glaziou 17381* (lectotype, designated here, W; isotype, K).

Nees (1829) mentioned "Habitat in Brasilia australiore—*Sellow* vidi in herb. Reg. Berol." in the protologue of *Andropogon carinatus*. An extensive search by the curatorial staff at B and by the first author failed to locate the cited specimen or any collection of *A. carinatus* by Sellow. The material was probably destroyed during World War II. Two specimens annotated "Brasilia, *Sellow*," identified as *A. carinatus* by Nees, one at K and one at W, were found. Even though the W specimen has better inflorescences, the K specimen is being designated as the lectotype because it is the only one with an original label from B attached to its sheet. According to Filgueiras (2003), there is one isotype at LE, but this specimen was not checked for this work.

Two collections of *Andropogon carinatus* var. *leiophyllus*, *Glaziou 17381* and *Glaziou 17382*, were mentioned in the protologue. Both were found at W. The first one has a duplicate at K and the second at BR. The specimen *Glaziou 17381* deposited at W is the more complete and best preserved, and agrees with the morphology described in the original description. Therefore, it is chosen as the lectotype.

Andropogon hypogynus Hackel, in Martius & Eichler, Fl. Bras. 2(3): 290. 1883. TYPE: "Brasilia, *Riedel 1655*" (lectotype, designated here, G; isotype, K).

Hackel (1883) described *Andropogon hypogynus* var. *genuinus*, variety *anatherus*, and variety *conjugens*. For *A. hypogynus* var. *genuinus* the author mentioned *Weddell 1858*, *Sellow s.n.*, *Warming s.n.*, and *Riedel s.n.*; the first two were not located during this research. The specimen of Warming deposited at W bears an inflorescence of the variety *conjugens* mixed with a complete specimen of the variety *genuinus*, as mentioned by Hackel (1883). Further, the same sheet contains one envelope with a fragment of *Riedel 1655*, corresponding also to *A. hypogynus* var. *genuinus*, probably the same as *Riedel s.n.* cited by Hackel (1883). All this mixed material was identified by Hackel. One specimen of *Riedel 1655* was found at G. It was chosen as the lectotype of *A. hypogynus* because it is more complete and better preserved than the Warming collection at W. There is no other material mixed on the sheet. There is no doubt that it corresponds to *Riedel* mentioned by Hackel (1883) in the protologue of the species because it is identified in the author's handwriting as "*A. hypogynus* Hackel in Mart. F. Br." There is also one duplicate of *Riedel 1655* at K, for which there is no indication of having been seen by Hackel.

Andropogon ingratus Hackel, Oesterr. Bot. Z. 51(5): 151. 1901. TYPE: "Brasilia, Provincia Minarum, 1891, *Glaziou n. 18681*" (lectotype, designated here, W; isotypes, US, W).

Hackel (1901) indicated *Glaziou 18681* in the protologue of *Andropogon ingratus*, of which there are two specimens at W annotated by him. There is one specimen at US also annotated by Hackel. The two specimens of W are better preserved: the more complete one is being designated as the lectotype and was annotated as such.

Andropogon palustris Pilger, Bot. Jahrb. Syst. 30(1): 137. 1901. TYPE: "Brasil, Mato Grosso, Jul. 1899, *Herrmann Meyer 732*" (lectotype, designated here, US).

The holotype deposited at B was destroyed during World War II. The US specimen seems to be the only sheet extant for the typic collection *Meyer 732* and is designated as the lectotype.

Andropogon selloanus (Hackel) Hackel, Bull. Herb. Boissier. 2(4): 266. 1904. *Andropogon leucostachyus* Kunth subsp. *selloanus* Hackel, in A. DC. & DC., Monogr. Phan. 6: 420. 1889. TYPE: "Brasilia *Sello*" (lectotype, designated here, W; isotypes, K, W).

In the protologue of *Andropogon leucostachyus* subsp. *selloanus*, Hackel (1889) cited two collections from Brazil, *Sellow s.n.* and *Weddel 2711*, besides *Balansa 279a* from Paraguay. Two unnumbered specimens of *Sellow* and one of *Balansa 279a* were found at W, all of them with original notes made by Hackel. The morphology of the two Sellow specimens agrees better with the original description, and the more complete one was selected as the lectotype. Another unnumbered specimen of Sellow was found at K, also annotated by Hackel.

Other Sellow specimens of *A. leucostachyus* subsp. *selloanus* were examined at K and W. However, although their morphology agrees with the original description, they were not considered for lectotypification because it appears that Hackel did not see them.

Renvoize (1998) cited *Balansa 279* as an isosyntype of *A. selloanus*, but this specimen, also from Paraguay, was collected in a different locality from that of *Balansa 279a* and was not considered for lectotypification.

Acknowledgments. The authors are grateful to the curators of the herbaria cited and to the Margaret Mee Foundation for financial support to the first author. The second author thanks the Brazilian Research Council (CNPq) for a fellowship.

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Volume 15, Number 1, pp. 1–252 of NOVON was published on 29 April 2005.

Volume 15
Number 2
2005

NOVON

Three New Species of *Bomarea* (Alstroemeriaceae) from the Andean Region of Colombia

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Abstract. Three new species of *Bomarea* (Alstroemeriaceae), *B. caucana*, *B. euryantha*, and *B. straminea*, found during a revision of the genus for the *Flora of Colombia*, are described and illustrated and their relationships discussed.

Resumen. Se describen e ilustran tres nuevas especies de *Bomarea* (Alstroemeriaceae), *B. caucana*, *B. euryantha* y *B. straminea*, encontradas durante la revisión del género para la *Flora de Colombia*, y se discuten sus relaciones.

Key words: Alstroemeriaceae, *Bomarea*, Colombia.

The genus *Bomarea* (Mirbel, 1804; Alstroemeriaceae) mostly inhabits Andean forests between 1500 and 3000 m, with a few species occurring elsewhere both at lower elevations and at higher elevations on forest edges and in páramo formations. *Bomarea* is a monophyletic group closely related to *Alstroemeria* L. (Aagesen & Sanso, 2003; Sanso & Xifreda, 2001); Dahlgren et al. (1985) placed both genera in the family Alstroemeriaceae.

In the last taxonomic revision of *Bomarea*, Baker (1888) recognized 75 species; since then nearly 150 species have been described, especially from the northern Andean region of Colombia, Peru, and Ecuador (Sodiro, 1908; Killip, 1936a).

Within *Bomarea* three subgenera are currently recognized (Baker, 1878, 1882, 1888; Pax & Hoffmann, 1930; Killip, 1936b; Smith & Gereau, 1991): *Bomarea* subg. *Bomarea*, distinguished by flowers with completely inferior ovaries, dehiscent (capsular) fruits, resupinate leaves, and a usually elongate, climbing habit; *Bomarea* subg. *Sphaerine* (Herbert) Baker, characterized by a completely inferior ovary, indehiscent (berry-like) fruits, usually resupinate leaves often crowded on the distal portion of the stem, and erect to decumbent (never climbing) stems; and *Bomarea* subg. *Wichuraea* (M. Roemer) Baker, characterized by a partly inferior ovary, dehiscent (capsular) fruits, non-resupinate linear leaves with revolute margins, and stiffly erect stems with decurved stem apices. Notes regarding subgeneric placement are included in the discussion of each new species.

During preparation of a revision of *Bomarea* for the *Flora of Colombia*, I found several collections belonging to three undescribed species.

1. **Bomarea caucana** F. Alzate, sp. nov. TYPE: Colombia. Cauca: Mun. El Tambo, Reserva Natural El Tambito, selva de niebla, 1600 m, 4 Dec. 1998, *R. A. Serna, N. Goméz, O. Casañas, L. Ordoñez, M. Burbano & C. Gonzales 785* (holotype, CAUP). Figure 1.

Herba sarmentosa; caule glabro glabrescenteve. Lamina ovata usque ovato-lanceolata, 6–14 × 2.2–8.0 cm, infera folia glabra, nervis pilosis. Inflorescentia composita; bracteis foliaceis, 1.5–5.5 × 0.3–0.8 cm; bracteolis lanceolato-linearibus; radiis 2 ad 4, 2- ad 4-ramosis; pedicellis glabris pubescentibusve. Flores penduli; sepalis rubris, 2.0–2.6 cm longis; petalis rubris, 12–20 mm longis.

Sarmentose herb; roots not seen; stem 2–4 mm diam., glabrous to glabrescent when young; internodes 5–10 cm long. Leaves pseudopetiolate, resupinate; pseudopetiole 9–17 mm long, pilose; blade 6–14 × 2.2–8.0 cm, ovate to ovate-lanceo-

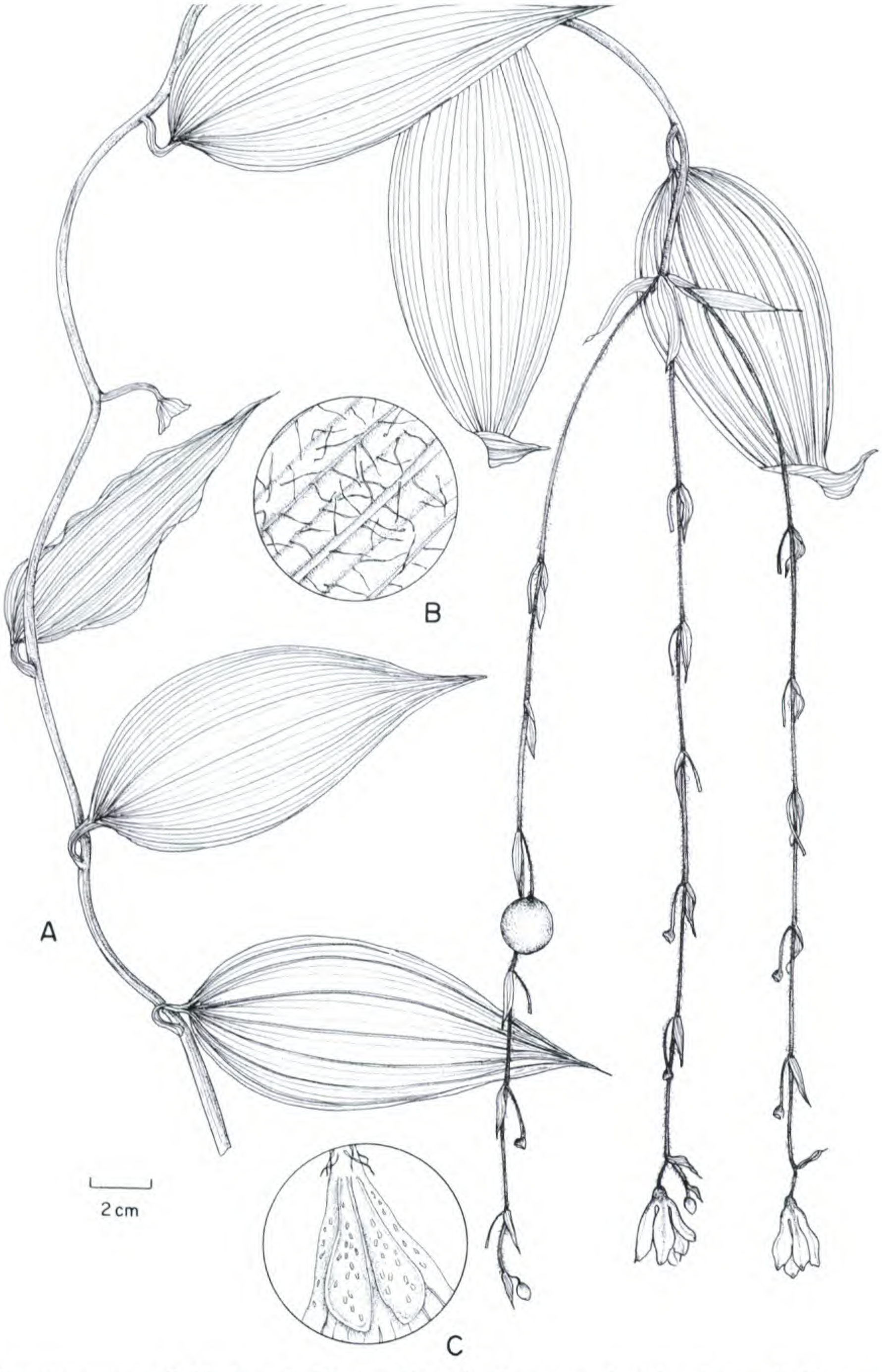

Figure 1. *Bomarea caucana* F. Alzate. —A. Plant. —B. Leaf pubescence, abaxial surface. —C. Ovary, external view. Drawn from *R. A. Serna et al. 785* (CAUP).

late, glabrous above, nerves pilose beneath, the internerves pustulate or reticulate, thinly papyraceous to chartaceous when dry, base acute, apex acuminate to cuspidate, margin revolute. Inflorescence compound, pendulous; bracts leaflike, pseudopetiolate to sessile, 1.5–5.5 × 0.3–0.8 cm, linear to lanceolate, acute at base, acuminate at apex, the margin revolute; bracteoles sessile, 1.0–2.5 × 0.3–0.9 cm, linear to lanceolate, lanulose or pustulate beneath, acuminate at apex; rays 2 to 4, 10–30 cm long, 2- to 4-branched, pilose to glabrescent; pedicels 1.0–2.5 cm long, glabrous to pubescent. Flowers pendulous; inner perianth segments longer than the outer; outer tepals 2.0–2.6 cm long, ovate, gla-

brous, red, obtuse at apex, the claw 1 mm long; inner tepals 1.2–2.0 cm long, oblanceolate, glabrous, red with yellow spots and purple costa, obtuse at apex; filaments 14–18 mm long, glabrous; anthers 3–4 mm long; ovary inferior, pubescent to glabrous, rugose to pustulate; style 22–24 mm long, glabrous; stigma trifurcate, decurrent, strigose. Capsule turbinate, 1.5–2.0 cm diam.; seeds 3–4 mm diam., spheroid to obloid, the sarcotesta yellow-red.

Distribution and habitat. *Bomarea caucana* is known from Cauca and Putumayo Departments in Colombia, where it is found in disturbed areas of premontane and montane wet forests (Holdridge, 1978) at altitudes of 1600–2910 m.

Phenology. This species presents two flowering and fruiting periods during the year; the first is February to April and the second July to September.

Etymology. The specific epithet makes reference to the department of Cauca, Colombia, where the largest population of this species is found.

Taxonomic relationships. This species is related to *Bomarea edulis* (Tussac) Herbert, sharing such features in common as a compound inflorescence and foliar indument and habit; *Bomarea caucana* is distinguished by its papyraceous leaf blades, which are pilose beneath only in the nerves, and its linear to lanceolate bracts. Because of its sarmentose stems, resupinate leaves, inferior ovary, and capsular fruit, *B. caucana* belongs to *Bomarea* subg. *Bomarea*.

Paratypes. COLOMBIA. **Cauca:** Mun. El Tambo, Par. Nac. Nat. Munchique, *T. Croat & J. Gaskin 80040* (AFP, CAUP, MO); Corr. 20 de Julio, carr. abandonada cerca de 2 km de la cabaña del Inderena, *R. Ruíz et al. 1180* (CAUP, COL, MO); vertiente occidental del río Munchique, *H. García-Barriga et al. 12947* (COL); Mun. Timbio, Km 54 of road from Timbio to 20 de Julio, *P. Maas & T. Plowman 2144* (COL, F). **Putumayo:** Mun. San Francisco, carr. hacia El Mirador, *R. Guarín 792* (PSO).

2. Bomarea euryantha F. Alzate, sp. nov. TYPE: Colombia. Cundinamarca: Mun. Albán, 2300 m, 17 Apr. 1950, *J. Idrobo 300* (holotype, COL). Figure 2.

Herba sarmentosa; caule glabro. Lamina ovata, glabra. Inflorescentia simplex; bracteis foliaceis, 5.5–10.0 × 2.0–4.5 cm; bracteolis foliaceis, 5–7 × 2–4 mm. Flores campanuli, segmentis perianthii aequalibus; sepalis 5.0–5.5 cm, brunneo-guttatis; petalis viridibus, roseo-maculatis; ovario glabro.

Sarmentose herb; roots not seen; stem 3–5 mm diam., terete, glabrous, pendent at apex; internodes 5.0–6.5 cm. Leaves pseudopetiolate, resupinate; pseudopetiole 8–15 mm long, glabrous; blade 10.5–15.0 × 4.5–6.5 cm, ovate, glabrous, granular above, pustulate beneath between major veins, cartilaginous when dry, the base obtuse to rounded, the apex acuminate, the margin distinctly revolute. Inflorescence simple; bracts leaflike, petiolate, 5.5–10.0 × 2.0–4.5 cm, ovate, glabrous, obtuse at base, acuminate at apex, the margin entire; bracteoles leaflike, sessile, 5–7 × 2–4 mm, linear to lanceolate, glabrous, acute to acuminate at apex, the margin entire; rays 3, 7.0–8.5 cm long. Flowers with perianth widely campanulate, the segments equal in length; outer tepals 5.0–5.5 cm long, ovate, pink with brown spots, glabrous, obtuse at apex, the claw 3–4 mm long; inner tepals 5.0–5.5 cm long, oblanceolate, green with pink spots and purple costa, glabrous, rounded to obtuse at apex, the claw 2–3 mm long; filaments 30–44 mm long, glabrous; anthers 5–8 mm long; ovary fully inferior, turbinate, rugose; style 40–48 mm long, glabrous. Fruit and seeds not seen.

Distribution and habitat. Known only from two collections, in the central region of the Cordillera Oriental of Colombia, at elevations between 2000 and 2400 m. The habitat of the type collection was not described by the collector, but to judge by the geographical data, it inhabits wet montane forests (Holdridge, 1978).

Phenology. Flowering in April and August.

Etymology. The epithet makes reference to the perianthal amplitude, observed in the large flowers of this species.

Taxonomic relationships. This species is related to *Bomarea andreana* Baker in having large flowers (5.0–5.5 cm long) and a simple inflorescence type. However, it differs by its low number of flowers (3) with a very wide perianth, which is a diagnostic character of this species. *Bomarea euryantha* is included in *Bomarea* subg. *Bomarea* because of its elongated, sarmentose stems, resupinate leaves, and fully inferior ovary. Definite subgeneric placement is not possible without knowledge of the fruit.

Paratype. COLOMBIA. **Cundinamarca:** Mun. Albán, vereda La Maria, Granjas del Padre Luna, *M. Amaya & J. Granados 737* (COL).

3. Bomarea straminea Killip ex F. Alzate, sp. nov. TYPE: Colombia. Valle del Cauca: Mun. Cali, Los Farallones, extremo N, vertiente oriental, entre Alto del Buey y Las Cascadas, bosques, 3250–3050 m, 13 Oct. 1944, *J. Cuatrecasas 18102* (holotype, VALLE; isotype, US). Figure 3.

Herba suberecta; caule glabro. Lamina lanceolata, 5.5–

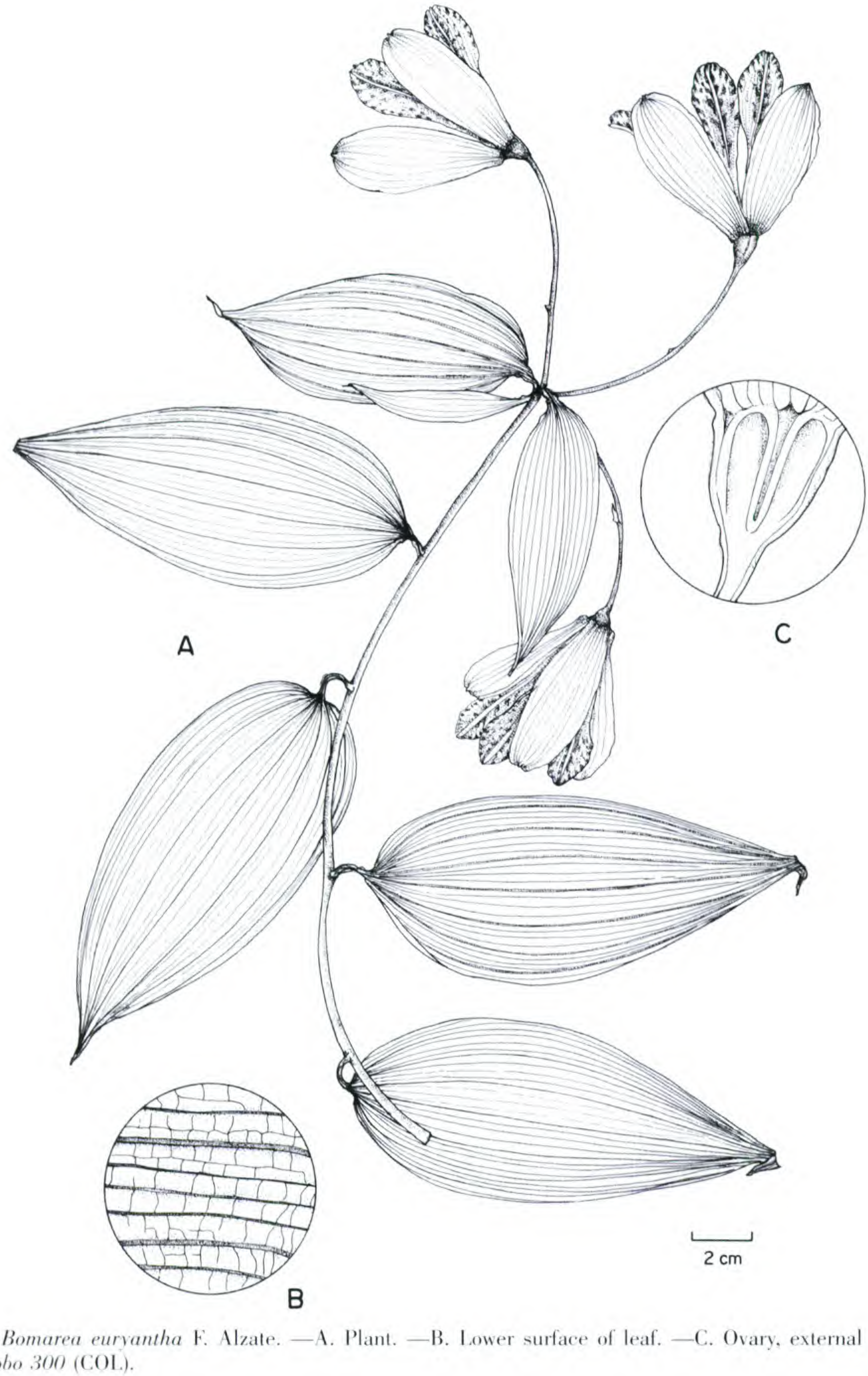

Figure 2. *Bomarea euryantha* F. Alzate. —A. Plant. —B. Lower surface of leaf. —C. Ovary, external view. Drawn from *J. Idrobo 300* (COL).

8.0 × 1.0–1.6 cm, infera folia glabra, nervis sparse pubescentibus. Inflorescentia composita; bracteis foliaceis; bracteolis foliaceis, pubescentibus; radiis 3 ad 5, 2- vel 3-ramosis, glabris, glabrescentibusve. Flores penduli, campanulati; sepalis aurantiaco-rubris, apice viride; petalis aurantiaco-rubris, purpureo-maculatis; ovario pubescente.

Suberect herb; roots not seen; stem 3–5 mm diam., glabrous; internodes 0.5–2.2 cm long. Leaves pseudopetiolate, resupinate; pseudopetiole 3–5 mm long, sparsely pubescent; blade 5.5–8.0 × 1.0–1.6 cm, lanceolate, glabrous above, the nerves glabrous to sparsely pubescent beneath, the internerves papillose or reticulate, coriaceous when dry, the base acute to attenuate, the apex acute to acuminate, the margin entire, revolute. Inflorescence compound; bracts leaflike, pseudopetiolate, 3.5–7.5

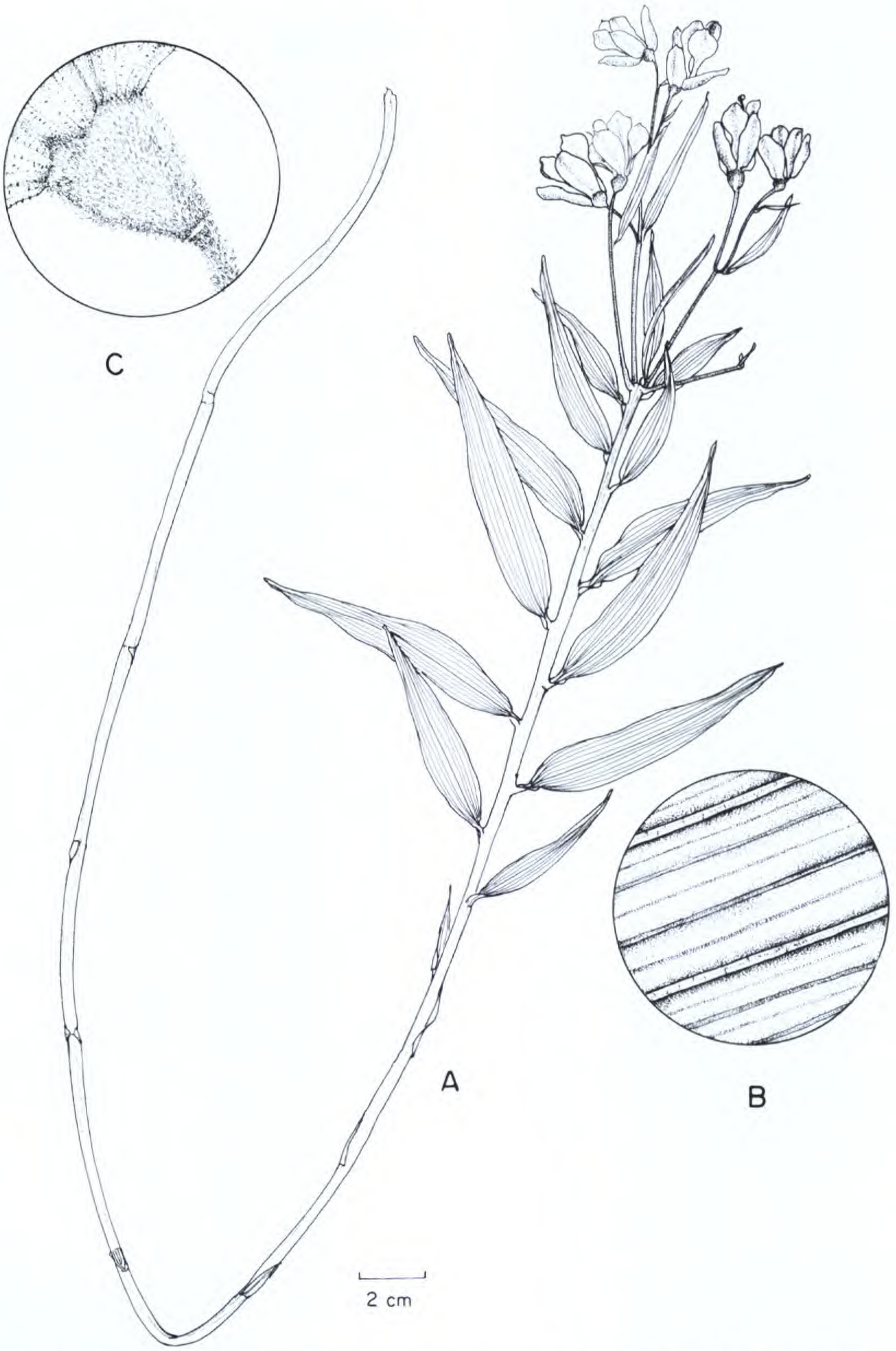

Figure 3. *Bomarea straminea* Killip ex F. Alzate. —A. Plant. —B. Lower surface of leaf. —C. Ovary, external view. Drawn from *J. Cuatrecasas 18102* (VALLE).

× 0.6–1.2 cm, lanceolate, glabrous to glabrescent, acute at base and apex, the margin moderately revolute; bracteoles leaflike, sessile, 3.0–4.0 × 0.3–0.8 cm, lanceolate, pubescent, acuminate at apex, the margin revolute; rays 3 to 5, 7–12 cm long, 2- or 3-branched, glabrous to glabrescent; pedicels 1.5–3.5 cm, glabrous. Flowers pendulous campanulate; outer tepals 1.6–2.0 cm long, ovate, orange-red, green at apex, acute at apex, strigose to glabrous, the claw 1 mm long; inner tepals 1.6–2.0 cm long, orange-red with purple spots and pink costa, oblanceolate to spatulate, mucronate at apex, strigose; filaments 15–22 mm long, glabrous; anthers 3–4 mm long; ovary inferior, papillose, rugose to strigose; style 18–24 mm long, pubescent. Capsule turbinate, 1.8–2.5 cm diam.; seeds 2–3 mm diam., obloid, the sarcotesta bright orange.

Distribution and habitat. *Bomarea straminea* is known from two disjunct localities in Colombia, one from the Eastern Cordillera in the department of Norte de Santander, and a second from the Western

Cordillera in Valle del Cauca where the species grows in montane forests and páramo borders at elevations of 2800–3250 m.

Phenology. This species has been observed in flower and fruit during February, July, and October.

Etymology. The specific epithet is a reference to the purple stems, observed principally in the young apex. The name of this species was suggested by Ellsworth P. Killip in several specimens in major Colombian herbaria, but it was never published.

Taxonomic relationships. *Bomarea straminea* seems to be related to *B. lehmanni* Baker because of its similar habit, compound umbels, and coriaceous leaf texture. However, *Bomarea straminea* is easily distinguished from this species by the number of flowers per inflorescence ray (2 or 3) and its larger flowers (1.6–2.0 cm long).

Paratypes. COLOMBIA. **Norte de Santander:** Mun. Pamplona, vertiente oriental, cerro al NE, páramo, *J. Cuatrecasas & H. García-Barriga 10203* (COL). **Valle del Cauca:** Mun. Cali, Cordillera Occidental, Los Farallones, vertiente NW, quebrada de Ramos, *J. Cuatrecasas 21848* (VALLE).

Acknowledgments. My thanks in particular to Ricardo Callejas (HUA) for his teaching and help in my studies, R. E. Gereau (MO) for useful comments on the manuscript, and Francisco Morales (INBio) for reading the manuscript. I am thankful to the staff of CAUP, COL, CUVC, F, HUA, MO, PSO, NY, and VALLE for the loan of herbarium specimens and collaboration during visits. The excellent drawings were made by Gloria Mora (HUA). Financial support was received from the Universidad de Antioquia and the Missouri Botanical Garden.

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Dubautia kalalauensis, a New Species of the Hawaiian Silversword Alliance (Compositae, Madiinae) from Northwestern Kaua'i, U.S.A.

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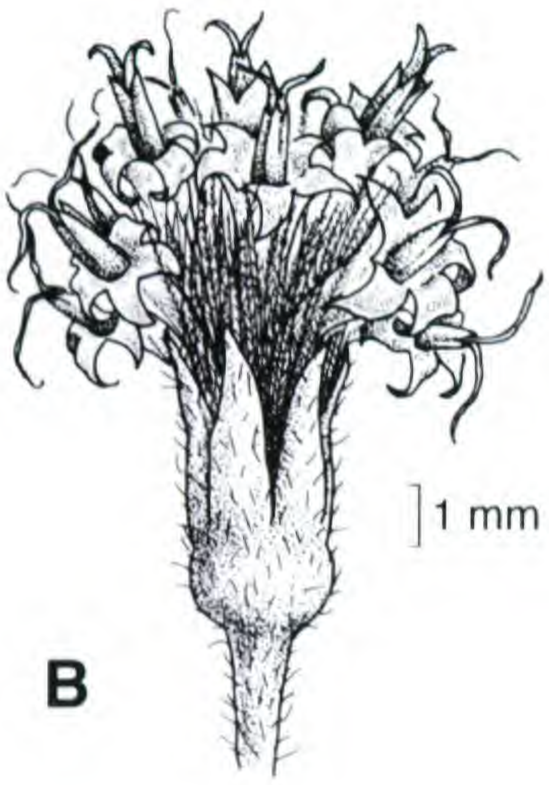
Abstract. *Dubautia kalalauensis* B. G. Baldwin & G. D. Carr is a newly described species of the Hawaiian silversword alliance (Compositae, Madiinae) from wet forests in the vicinity of the rim of Kalalau Valley, Kaua'i. The taxon has been treated within the circumscription of *D. laxa* Hooker & Arnott subsp. *hirsuta* (Hillebrand) G. D. Carr, but differs by having a more openly branching habit, softer leaf surfaces, greenish cream (rather than yellow) corollas, less glandular corolla tubes and throats, and longer pappus elements. Based on molecular phylogenetic data, *D. kalalauensis* is less closely related to the widespread *D. laxa* than to other Kaua'i endemics, including *D. imbricata* H. St. John & G. D. Carr, *D. kenwoodii* G. D. Carr, *D. laevigata* A. Gray, *D. syndetica* G. D. Carr & Lorence, and *D. waialealae* Rock. Unlike all previously described taxa of *Dubautia* Gaudichaud-Beaupré, *D. kalalauensis* combines opposite leaves, eglandular peduncles, receptacular bracts throughout the heads (one per floret), greenish cream corollas, and pappi of setiform scales ca. 4 mm long.

Key words: Asteraceae, Compositae, *Dubautia*, Hawaii, Kauai, Madiinae, silverswords, tarweeds.

The Hawaiian silversword alliance (*Argyroxiphium* DC., *Dubautia* Gaudichaud-Beaupré, and *Wilkesia* A. Gray) is most diverse on Kaua'i (Carr, 1985, 1999), the oldest high island of the archipelago (5.1 Ma; Clague & Dalrymple, 1987), where the number of endemic angiosperm taxa in general is higher than on any other island of the chain (Sakai et al., 2002). Both species of *Wilkesia* and all but 2 of 13 species of *Dubautia* on Kaua'i are known only from Kaua'i (Carr, 1985, 1999). Based on results of molecular phylogenetic analyses, the 15 indigenous species on Kaua'i represent two of four major lineages of the silversword alliance and may have descended from a common ancestor there (Baldwin & Robichaux, 1995; Baldwin, 1997, unpublished).

One major lineage of the silversword alliance from Kaua'i resolved with molecular data (nuclear ribosomal DNA transcribed spacer sequences) comprises all but three species of *Dubautia* known from the island (i.e., all species except *D. latifolia* (A. Gray) D. D. Keck, *D. paleata* A. Gray, and *D. raillardioides* Hillebrand) and all taxa with nuclear genomic arrangements designated by Carr and Kyhos (1986) as Dubautia Genome (DG) 1 and DG 3 (Baldwin, 1997, unpublished). Members of the DG 1 + DG 3 lineage are found in mesic, wet, or boggy habitats and include trees, subscandent to erect shrubs, and cushion plants (Carr, 1985, 1999; Baldwin & Robichaux, 1995). Expanded sampling of taxa and DNA sequences has led to resolution of a well-supported, finer-scale lineage within the DG 1 + DG 3 group that includes taxa of *Dubautia* with DG 3 or unknown genomic arrangements, including three of four species of the silversword alliance described since 1980: *D. imbricata* H. St. John & G. D. Carr, *D. kenwoodii* G. D. Carr, and *D. syndetica* G. D. Carr & Lorence (Baldwin, unpublished), each of highly limited geographic distribution (Carr, 1999). Here, we describe yet another geographically restricted species, from northwestern Kaua'i, that evidently belongs to this same, recently resolved lineage (Baldwin, unpublished).

Dubautia kalalauensis B. G. Baldwin & G. D. Carr, sp. nov. TYPE: U.S.A. Hawaii: Kaua'i, Hanalei, Koke'e State Park, rim of Kalalau Valley, ca. 100 m N of Hwy. 550 (22°08′56.1″N, 159°38′10.4″W), along SW tributary of Kalalau Stream, E slope, wet forest, 1205–1235 m, 6 Nov. 2004, *B. G. Baldwin & S. J. Bainbridge 1441* (holotype, UC; isotypes, BISH, F, HAW, MO, NY, PTBG, US). Figure 1.



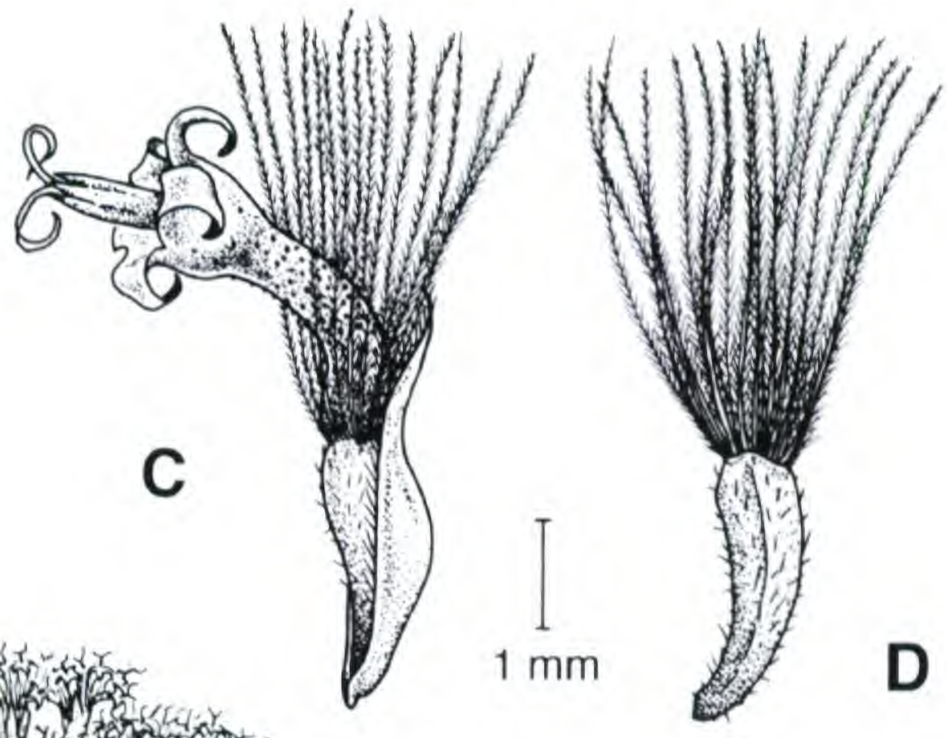


Figure 1. A–E. *Dubautia kalalauensis* B. G. Baldwin & G. D. Carr. —A. Flowering branch. —B. Head with peduncle. —C. Floret and associated receptacular bract. —D. Cypsela with pappus. —E. Habit (central plant in foreground) and wet-forest habitat. Drawn from the type.

A speciebus ceteris *Dubautiae* differt characteribus conjuncte: foliis oppositis, pedunculis eglandulosis, capitulis bracteis receptaculorum ubique (1 bractea in quoque flosculo), corollis viridulis-eburneis, squamis papporum setiformibus ca. 4 mm longis.

Openly branching shrubs or trees 1.8–3.5 m tall, vegetative stems ± strigose (trichomes often arcuate or flexuous) and dark purple or black distally, glabrescent and pale brown proximally, leaf scars glabrous or ± strigose; flowering stems ± strigose or hispid-hirsute. Leaves opposite, sessile, commonly 8–14 × 1.6–3.2 cm (up to 20 × 5.6 cm in juvenile plants), blades narrowly elliptic to oblanceolate, lime green and moderately ± strigose adaxially, yellow-green and somewhat more densely and coarsely ± strigose abaxially; margins shallowly toothed along distal ⅔ to ¾ of length, sparsely ciliolate or eciliate; apices acuminate; bases attenuate, petioloid; venation acrodromous, with 7 basal to suprabasal veins. Inflorescences as heads, discoid, (6 to)15 to 55, in dense, cymo-corymbiform (flat-topped or rounded) arrays, 4–10 cm long, 4–10 cm wide, the stalks and peduncles densely hispid-hirsute, eglandular, peduncles 0–5(–7) mm long; receptacles glabrous, flat or convex, false involucres (of outermost receptacular bracts) cylindrical to narrowly campanulate, receptacular bracts 8 to 16, one associated with (and partially enveloping) each floret, linear to linear-lanceolate, free or coalescent to ⅓ of length proximally, the outermost 4.5–6 mm long, usually green, sometimes purplish, ± strigose, eglandular; florets 8 to 16, corollas exserted, greenish cream, aging pinkish to reddish brown (often drying dark purple), 3–5.5 mm long, usually slightly exceeding pappi, tubes/throats arcuate or recurved, glabrous or sparsely glandular proximally, moderately glandular distally, throats abruptly dilated distally, lobes narrowly triangular, usually reflexed, 0.8–1 mm long, sparsely setulose abaxially; anthers reddish purple or maroon; cypselae black, straight or arcuate, ca. 2–3 mm long, ± strigose; pappi of 19 to 24, stramineous to brown or reddish purple, mostly subequal, fimbriate, setiform scales ca. 4 mm long.

Distribution. The species is known only from the vicinity of the southern rim of Kalalau Valley, north of Koke'e Road (Highway 550), from near Kalalau Lookout east to slopes bordering a southwestern tributary of Kalalau Stream, west of Pu'u o Kila. Known collections span an elevational range of 1205–1235 m.

Habitat. Dubautia kalalauensis occurs on densely vegetated, windward slopes and at streamsides in wet forests. Along the tributary of Kalalau Stream west of Pu'u o Kila, the first author observed 26 plants (mostly juveniles) during a single traverse from the upper eastern slope to the streambed. Woody associates include species of *Metrosideros* Banks ex Gaertner, *Scaevola* L., *Broussaisia* Gaudichaud-Beaupré, *Cheirodendron* Nuttall ex Seemann, *Pittosporum* Banks ex Gaertner, and *Hedyotis* L. Associated ferns include species of *Elaphoglossum* Schott ex J. Smith, *Sadleria* Kaulfuss, *Cibotium* Kaulfuss, and *Pneumatopteris* Nakai. Alien *Rubus argutus* Link (Florida blackberry), *Hedychium gardnerianum* Ker Gawler (Kahili ginger), and *Passiflora mollissima* (Kunth) L. H. Bailey (banana poka) are well established. *Passiflora mollissima* appears to pose a particularly serious threat: most large, flowering individuals of *D. kalalauensis* observed by the first author at the type locality were almost entirely obscured by a dense covering of banana poka. Taxa of *Dubautia* observed in proximity to *D. kalalauensis* are *D. knudsenii* Hillebrand subsp. *knudsenii*, *D. laevigata* A. Gray, and *D. microcephala* Skottsberg. Natural hybrids between *D. kalalauensis* and *D. laevigata* (*Carr 1370*, BISH, HAW, NY, UC, WS; *Flynn & Lowrey 1875*, PTBG), reported earlier by Carr (1999), have been collected on and just below the rim of Kalalau Valley.

Phenology. Flowering specimens have been collected from August to November.

Relationships. Members of *Dubautia kalalauensis* were previously treated provisionally within the circumscription of the morphologically similar *D. laxa* Hooker & Arnott subsp. *hirsuta* (Hillebrand) G. D. Carr (Carr, 1985, 1990, 1999). Field observations in the 1980s by Tim Flynn, Curator of the Herbarium at the National Tropical Botanical Garden, first brought attention to these plants from the vicinity of Kalalau rim that appeared to be members of *D. laxa* subsp. *hirsuta* with white, rather than yellow, corollas. Based on examination of specimens from the field and herbaria, Carr (1990: 301) indicated that the Kalalau plants differed from other populations of *D. laxa* subsp. *hirsuta* (including the type) in leaf vestiture ("finer pubescence") as well as corolla color and "may represent a new taxon." He later noted that the Kalalau plants also differ from typical *D. laxa* subsp. *hirsuta* by having longer pappus elements and less glandular corolla tubes (Carr, 1999). Comparison of 18S–26S ribosomal DNA sequences of the external and internal transcribed spacers (ETS and ITS) with those of all other recognized taxa of the silversword alliance revealed that the Kalalau plants represent a unique lineage within a well-supported clade that also includes *D. imbricata*, *D.*

kenwoodii, *D. laevigata*, *D. syndetica*, and *D. waialealae* Rock (Baldwin, unpublished).

The relationship between *D. kalalauensis* and *D. laxa* is sufficiently remote based on rDNA data to lead us to conclude that similarities between the two taxa are likely the result of evolutionary convergence and shared primitive (plesiomorphic) characteristics. In hindsight, the presence of only moderate, abaxial glandulosity on the corolla tubes and throats of *D. kalalauensis* is perhaps the best morphological evidence for a distant relationship with *D. laxa*; densely and coarsely glandular corolla tubes are diagnostic and universal for the lineage comprising *D. laxa*, *D. knudsenii*, and *D. pauciflorula* H. St. John & G. D. Carr (Carr, 1985; Baldwin, 1997). Ancient gene flow across lineages cannot be ruled out as a potential explanation for shared morphological characteristics of *D. kalalauensis* and *D. laxa* subsp. *hirsuta*, although rDNA sequences provide no evidence consistent with that possibility. Cytogenetic evidence from a natural hybrid between *D. kalalauensis* and *D. laevigata* (Carr, 1999) and from artificial hybrids involving *D. laxa*, *D. laevigata*, and other species of *Dubautia* (Carr, 1985; Carr & Kyhos, 1986) demonstrates that *D. kalalauensis* and *D. laxa* are, at most, differentiated genomically by two reciprocal translocations, a minor barrier to introgression involving non-recombined regions of the genomes (see Carr, 1995). Opportunities for modern gene exchange appear to be limited extrinsically; the two taxa are not known to co-occur and may be ecologically distinct, with *D. laxa* subsp. *hirsuta* occurring largely in boggy situations and on foggy, wind-swept ridges, rather than in wet forests (Carr, 1985, 1999). Divergence in ecological and physiological features associated with occupancy of different habitats has been a major feature of diversification of the silversword alliance (Robichaux et al., 1990; Baldwin & Robichaux, 1995) and may be sufficient under natural conditions to prevent introgressive hybridization between interfertile taxa, e.g., through post-dispersal selection against hybrids (Kyhos et al., 1981; Carr, 1995).

Etymology. The species epithet refers to the rim of Kalalau Valley, Kaua'i, where all known populations of the taxon occur.

Conservation status. *Dubautia kalalauensis* appears to be in danger of extinction based in part on its rarity and small geographic range. As noted above (under "*Habitat*"), invasive plants threaten the only known, sizable population, at the type locality, where measures to control *Passiflora mollissima* (especially), *Rubus argutus*, and *Hedychium gardnerianum* may be necessary to prevent extirpation of *D. kalalauensis*. Efforts to relocate historical occurrences and discover additional populations along the rim of Kalalau Valley are warranted.

Paratypes. U.S.A. **Hawaii:** Kaua'i, Hanalei, Koke'e State Park, E rim of Kalalau Valley, *O. Degener 23854* (BISH, UC); Kalalau Pali, *C. N. Forbes 1034.K* (BISH), *Forbes 1697.K* (BISH); just below lookout, *S. Carlquist H12* (BISH, UC); Hwy. 550 near mi. 18.3, at back of Kalalau Valley, *T. W. Flynn 1171* (BISH, HAW), *Flynn 1352* (PTBG); rim of Kalalau Valley near Kaluapuhi Trailhead betw. Kalalau & Pu'u o Kila lookouts, *G. D. Carr & Flynn 1330* (BISH); just below trail along Kalalau Valley rim, *Flynn & T. K. Lowrey 1874* (BISH, PTBG).

Acknowledgments. Research support was provided in part by a grant from the National Science Foundation (DEB-9458237, to BGB) and an award from the U.C. Berkeley Chancellor's Fund (to BGB). We thank Timothy W. Flynn for originally bringing our attention to the uniqueness of the Kalalau plants described here, Susan J. Bainbridge for field assistance, Bridget L. Wessa for lab assistance, John L. Strother and Alan R. Smith for assisting with the Latin diagnosis and for reviewing the manuscript, Lesley Randall for preparing the illustrations, and Wayne Souza (Hawaii Division of State Parks) for permission to collect *Dubautia* in Koke'e State Park.

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New Combinations in Chinese *Polyspora* (Theaceae)

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Abstract. For the Theaceae treatment in the *Flora of China*, volume 12, it was found that several specific epithets have not yet been validly transferred from *Gordonia* Ellis to *Polyspora* Sweet ex G. Don. In this article the following five species are transferred from *Gordonia* to *Polyspora*: *Polyspora chrysandra* (Cowan) Hu ex B. Bartholomew & T. L. Ming, *P. hainanensis* (Hung T. Chang) C. X. Ye ex B. Bartholomew & T. L. Ming, *P. longicarpa* (Hung T. Chang) C. X. Ye ex B. Bartholomew & T. L. Ming, *P. speciosa* (Kochs) B. Bartholomew & T. L. Ming, and *P. tonkinensis* (Pitard) B. Bartholomew & T. L. Ming. Three species, *Gordonia axillaris* Roxburgh ex Ker Gawler, *Gordonia tonkinensis* Pitard, and *Thea speciosa* Kochs, as well as the one variety *Gordonia axillaris* var. *acuminata* E. Pritzel, are lectotypified.

Key words: China, *Gordonia*, *Polyspora*, Theaceae.

Recent molecular evidence has shown that the Chinese species often treated as *Gordonia* Ellis are not closely related to the North American species *G. lasianthus* (L.) Ellis, the type species of the genus, and should be treated as a different genus (Prince & Parks, 2001; Yang et al., 2004). On the basis of priority, the generic name that must be used for these species is *Polyspora* Sweet ex G. Don. Although several of the Chinese species have been treated in the literature as *Polyspora* (Hu, 1963; Prince & Parks, 2001; Yang et al., 2004; Ye, 1990), for the recognized taxa only the combination *Polyspora axillaris* (Roxburgh ex Ker Gawler) Sweet ex G. Don has been validly made. In order to treat the Chinese species of *Polyspora* in the *Flora of China*, volume 12, five combinations must be validly made. The six species of *Polyspora* that occur in China include the following:

1. **Polyspora axillaris** (Roxburgh ex Ker Gawler) Sweet ex G. Don, Gen. Hist. 1: 574. 1831. Basionym: *Camellia axillaris* Roxburgh ex Ker Gawler, Bot. Reg. 4: t. 349. 1818. *Gordonia axillaris* (Roxburgh ex Ker Gawler) D. Dietrich, Syn. Pl. 4: 863. 1847. TYPE: plate in the original protologue, Bot. Reg. 4: t. 349. 1831 (lectotype, designated here).

This species occurs in forests and thickets from 100 to 800(–2300) m in Guangdong, Guangxi, Hainan, and Taiwan, China (Chang, 1998), and Vietnam (Ho, 1991).

There is no type specimen for this species, so the plate in the original protologue is chosen as the lectotype.

2. **Polyspora chrysandra** (Cowan) Hu ex B. Bartholomew & T. L. Ming, comb. nov. Basionym: *Gordonia chrysandra* Cowan, Notes Roy. Bot. Gard. Edinburgh 16: 184. 1931. TYPE: China. Yunnan: lava bed W of Tengyueh, 25°N, 5000 ft., Nov. 1912, *G. Forrest 9234* (holotype, E; isotype, A).

This species occurs in forests and thickets from 1100 to 2400 m in Guizhou, Sichuan, and northwestern Yunnan, China, and northern Myanmar (Chang, 1998; Ming, 1997).

H. H. Hu proposed the combination *Polyspora chrysandra* (Hu, 1972) but did not include the basionym reference citation.

3. **Polyspora hainanensis** (Hung T. Chang) C. X. Ye ex B. Bartholomew & T. L. Ming, comb. nov. Basionym: *Gordonia hainanensis* Hung T. Chang, Acta Sci. Nat. Univ. Sunyatseni 22(2): 111. 1983. TYPE: China. Hainan: Jianfengling, *T. Q. Yu 11206* (holotype, SYS).

This species occurs in forests from 300 to 1500 m in Hainan, China (Chang, 1998).

C. X. Ye proposed the combination *Polyspora hainanensis* (Ye, 1990) but did not include the basionym reference citation.

4. Polyspora longicarpa (Hung T. Chang) C. X. Ye ex B. Bartholomew & T. L. Ming, comb. nov. Basionym: *Gordonia longicarpa* Hung T. Chang, Acta Sci. Nat. Univ. Sunyatseni 22(2): 111. 1983. TYPE: China. Yunnan: Tengchong. *J. Chen 2-77* (holotype, KUN).

This species occurs in forests from (1000–)1700 to 2500 m in southeastern to southwestern Yunnan China, northern Myanmar, northeastern Thailand, and northern Vietnam (Chang, 1998; Keng, 1972; Ming, 1997). Keng (1972) recorded *Gordonia axillaris* as occurring in northeastern Thailand, which was before *G. longicarpa* had been named, but from his description the plant is clearly *Polyspora longicarpa*.

C. X. Ye proposed the combination *Polyspora longicarpa* (Ye, 1990) but did not include the basionym reference citation.

5. Polyspora speciosa (Kochs) B. Bartholomew & T. L. Ming, comb. nov. Basionym: *Thea speciosa* Kochs, Bot. Jahrb. Syst. 27: 597. 1900. *Camellia speciosa* (Kochs) Cohen-Stuart, Med. ed. Proefstat. Thee 60: 67. 1916. TYPE: China. Sichuan: Maup'o shan, im Urwald, 3 Sep. 1891, *C. Bock & A. von Rosthorn 754* [as "*454*"] (holotype, B destroyed; lectotype, designated here, GZU).

Gordonia axillaris (Roxburgh ex Ker Gawler) Sweet ex G. Don var. *acuminata* E. Pritzel, Bot. Jahrb. Syst. 29: 473. 1900. *Gordonia acuminata* (E. Pritzel) Hung T. Chang, Acta Sci. Nat. Univ. Sunyatseni 22(2): 112. 1983. TYPE: China. Sichuan: Nan ch'uan, Ta ho kou, 31 July 1891, *C. Bock & A. von Rosthorn 147* (syntype, B destroyed; lectotype, designated here, O; isotypes, GZU, O). China. Sichuan: Mao p'o shan, Sep. 1891, *C. Bock & A. von Rosthorn 754* (syntype, B destroyed; isosyntype, GZU).

Gordonia kwangsiensis Hung T. Chang, Acta Sci. Nat. Univ. Sunyatseni 22: 112(2). 1983. TYPE: China. Guangxi: Damiao Mountain, *S. H. Chun 16467* (holotype, IBSC).

This species occurs in forests from 1200 to 2000 m in northern Guangxi, Guizhou, southern to southwestern Sichuan (including the Chongqing Municipality, formerly part of Sichuan), and Yunnan, China (Chang, 1998).

The only specimen cited by Kochs (1900) for *Thea speciosa* was "Bock & von Rosthorn 454." Although the holotype at B is lost, there is compelling evidence that 454 is an error, and the number in the protologue should have been 754. By checking the dates and collection numbers cited in Diels (1900–1901) it is evident that *Bock & von Rosthorn* numbers between at least 192 and 707 were collected in August 1891. In the protologue for *Thea speciosa*, Kochs stated that the collection was made in September, whereas *Bock & von Rosthorn* numbers for September 1891 started with 708. The holotype of *Thea speciosa* was not only collected on the same date, but also at the same Chinese collection locality (with minor transcription differences in spelling) as *Bock & Rosthorn 754*. Furthermore, in the treatment for Simarubaceae by Pritzel in Diels (1900–1901), *Bock & von Rosthern 454* is identified as *Picrasma ailanthoides* (Bunge) Planchon. Unfortunately, no archival information that might throw additional light on this matter is available at B (Robert Vogt, pers. comm.), GZU (Anton Drescher, pers. comm.), or O (Per Sunding, pers. comm.). Quite likely collection number 754 was misread as 454 either when the handwritten label on the specimen was transcribed or possibly when a handwritten manuscript was set in type.

In flower *Polyspora* and *Camellia* (*Thea*) are very similar, and this no doubt was why Kochs originally placed the flowering specimen of *Bock & von Rosthorn 754* in *Thea*. However, because the fruit of *Polyspora* and *Camellia* (*Thea*) are very different, once it was realized that the fruiting specimen of *Bock & von Rosthorn 147* was the same species, it would have been clear that *Thea speciosa* was in the wrong genus. In the treatment of Theaceae in *Die Flora von Central-China* (Diels, 1900–1901), Pritzel and Kochs realized that *T. speciosa* should be treated as a *Gordonia*. This treatment in Diels's article was by both Kochs (who authored *Thea*) and Pritzel (who authored the rest of the family). Pritzel did not reduce *Thea speciosa* to a variety of *Gordonia axillaris*, but rather selected a different infraspecific epithet, based his *Gordonia axillaris* var. *acuminata* E. Pritzel on two syntypes (one of which was the holotype of *T. speciosa*), and gave *T. speciosa* Kochs as a synonym for his new variety. However, at the specific level *T. speciosa* has priority, so Pritzel's specific epithet *speciosa* must be used when treating this taxon as a species. Because the holotype of *T. speciosa* and both syntypes of *G. axillaris* var. *acuminata* have been destroyed, it is appropriate to lectotypify *T. speciosa* on the only known isotype and to lectotypify *G. axillaris* var. *acuminata* on one of the extant fruiting isosyntypes.

C. X. Ye proposed the combination *Polyspora kwangsiensis* (Ye, 1990) but did not include the basionym reference citation and misspelled the specific epithet as "*gwangsiensis*." However, this combination is not being validated here because the species is now reduced to a synonym. H. T. Chang proposed the species *Gordonia szechuanensis* (Chang, 1983) for what is the same species as *Po-*

lyspora speciosa, but he did not supply Latin description or diagnosis.

6. Polyspora tonkinensis (Pitard) B. Bartholomew & T. L. Ming, comb. nov. Basionym: *Gordonia tonkinensis* Pitard, in Lecomte, Fl. Gen. Indo-Chine 1: 348. 1910. TYPE: Vietnam. Tonkin environ de Ninh-binh, 1883–1891, *Abbé R. P. Bon 60* (lectotype, designated here, P).

This species occurs in forests and thickets from 1200 to 2100 m in southern Guangxi, southeastern Yunnan, China, and northern Vietnam (Ming, 1997).

KEY TO THE SPECIES OF *POLYSPORA* IN CHINA

1a. Leaf blade apex rounded, obtuse, or emarginate.
  2a. Petiole 10–15 mm, glabrous; leaf blade margin entire or apically remotely crenate . . . . . 1. *P. axillaris*
  2b. Petiole 3–5 mm, appressed pubescent; leaf blade margin serrate . . . . . 2. *P. chrysandra*
1b. Leaf blade apex bluntly acute, acuminate, or shortly acuminate.
  3a. Current year branchlets, petioles, leaf blades abaxially, and filaments basally all with trichomes; capsule 4–5 cm long . . . . . 4. *P. longicarpa*
  3b. Current year branchlets, petioles, leaf blades, and filaments glabrous (branchlets subglabrous in *P. tonkinensis*); capsule 1–3.5 cm long.
    4a. Young branches slender; leaf blade narrowly oblong to oblanceolate, 8–13 × 2–3 cm; flowers ca. 4 cm diam . . . . . 3. *P. hainanesis*
    4b. Young branches stout; leaf blade elliptic to oblong-elliptic, 9–18 × 3–6 cm; flowers 5 cm or more diam.
      5a. Terminal buds large, purplish red, glabrous; petiole 1.5–2 cm; flowers 8–10 cm diam.; style ca. 2 cm . . . . . 5. *P. speciosa*
      5b. Terminal buds small, white sericeous; petiole 0.8–1.5 cm; flowers 5–6 cm diam.; style ca. 1.5 cm . . . . . 6. *P. tonkinensis*

Acknowledgments. We thank Thomas F. Daniel (CAS), Anton Drescher (GZU), Peter W. Fritsch (CAS), Per Sunding (O), and Robert Vogt (B) for assistance during preparation of this article.

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Pennellia brachycarpa (Brassicaceae), a New Species from Jujuy, Argentina

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ABSTRACT. *Pennellia brachycarpa* (Brassicaceae), a new species from the province of Jujuy in northern Argentina, is described and illustrated. The new species is distinguished from other members of the genus by having corymbose rather than lax racemes and forked and Y-shaped instead of dendritic trichomes.

Key words: Argentina, Brassicaceae, Jujuy, *Pennellia*.

Pennellia Nieuwland (Brassicaceae) is a genus of 7 to 11 species distributed in the southern United States, Mexico, Central America, Colombia, and disjunctly into Bolivia and northern Argentina (Rollins, 1980; Appel & Al-Shehbaz, 2003; Fuentes-Soriano, 2004). The genus is easily distinguished from its nearest relatives in the Halimolobine clade (Bailey et al., 2002), which consists of *Halimolobos* Tausch, *Mancoa* Weddell, *Pennellia*, and *Sphaerocardamum* S. Schauer, by its cup-shaped flowers, purple to purple-tipped sepals, and petals sub-equaling or slightly longer than sepals.

The novelty described herein, *Pennellia brachycarpa*, was collected during fieldwork in northern Argentina in connection with a broad, ongoing phylogenetic study of the family Brassicaceae. Phylogenetic results from the chloroplast gene *ndh*F indicate that this species is closely related to the North American *P. longifolia* (Bentham) Rollins, a species distributed in Arizona, New Mexico, Texas, and southward throughout Mexico to Guatemala (Fuentes-Soriano, 2004). *Pennellia* was previously known from Argentina and Bolivia only by *P. boliviensis* (Muschler) Al-Shehbaz (Al-Shehbaz, 1990; Fuentes-Soriano, 2004). The inclusion of *P. brachycarpa* in *Pennellia* reinforces the southern distribution of the genus.

Pennellia brachycarpa Beilstein & Al-Shehbaz, sp. nov. TYPE: Argentina. Jujuy: Abra Pampa, S of Abra Pampa City off route 9, among rocks on isolated hilltop, 3650 m, 22°49.352′S, 65°41.324′W, 10 Feb. 2003, *Mark Beilstein, Noah Whiteman & Donna Eakman 03-148* (holotype, MO). Figure 1.

Herba perennis 7.5–27 cm alta, pilis furcatis brevi-stipitatis et simplicibus praedita. Folia basalia oblanceolato-spathulata, 1–3 × 0.3–1 cm, margine subintegra vel serrulata; folia caulina sessilia, non auriculata, 0.7–2.6 cm × 1–5 mm. Racemi 7–30-flori, ebracteati; pedicelli fructiferi tenues, recti, 7–10 mm longi. Sepala oblonga, sparse pilosa, ca. 2 × 1 mm; petala alba, anguste spathulata, 2–2.5 × 0.6–0.8 mm; ovula 50–64; stylo 0.1–0.2 mm longo. Fructus lineares, 1.3–1.7 cm × ca. 1 mm, teretes, glabri; semina ovata, ca. 0.25 × 1 mm, subbiseriata.

Plants perennial, 7.5–27 cm tall; trichomes of stems, leaves, and sepals short- stalked and forked, these mixed with simple ones along stem and leaf midvein, to 0.3 mm long, rarely a few dendritic ones on leaf margin; stems erect, single, few-branched, and glabrous above. Basal leaves subsessile, oblanceolate-spatulate, 1–3 × 0.3–1 cm, base attenuate, margin subentire to serrulate, apex obtuse; cauline leaves sessile, not auriculate at base, oblong-linear, 0.7–2.6 cm × 1–5 mm, margin entire, apex subacute. Raceme ebracteate, corymbose, 7- to 30-flowered, rachis straight; fruiting pedicels very sparsely hairy, ascending, straight, slender, 7–10 mm long. Sepals oblong, green with purple tips, ca. 2 × 1 mm, not saccate, sparsely pubescent below apex; petals white, narrowly spatulate, not clawed, 2–2.5 × 0.6–0.8 mm; filaments 1–1.2 mm long; anthers ovate, ca. 0.6 mm long; ovules 50 to 64; style 0.1–0.2 mm. Fruit linear, 1.3–1.7 cm × ca. 1 mm, terete, slightly curved; valves glabrous, smooth; midvein distinct basally, obscure distally; stigma entire; seeds subbiseriate, brown, ovate, ca. 0.25 × 1 mm.

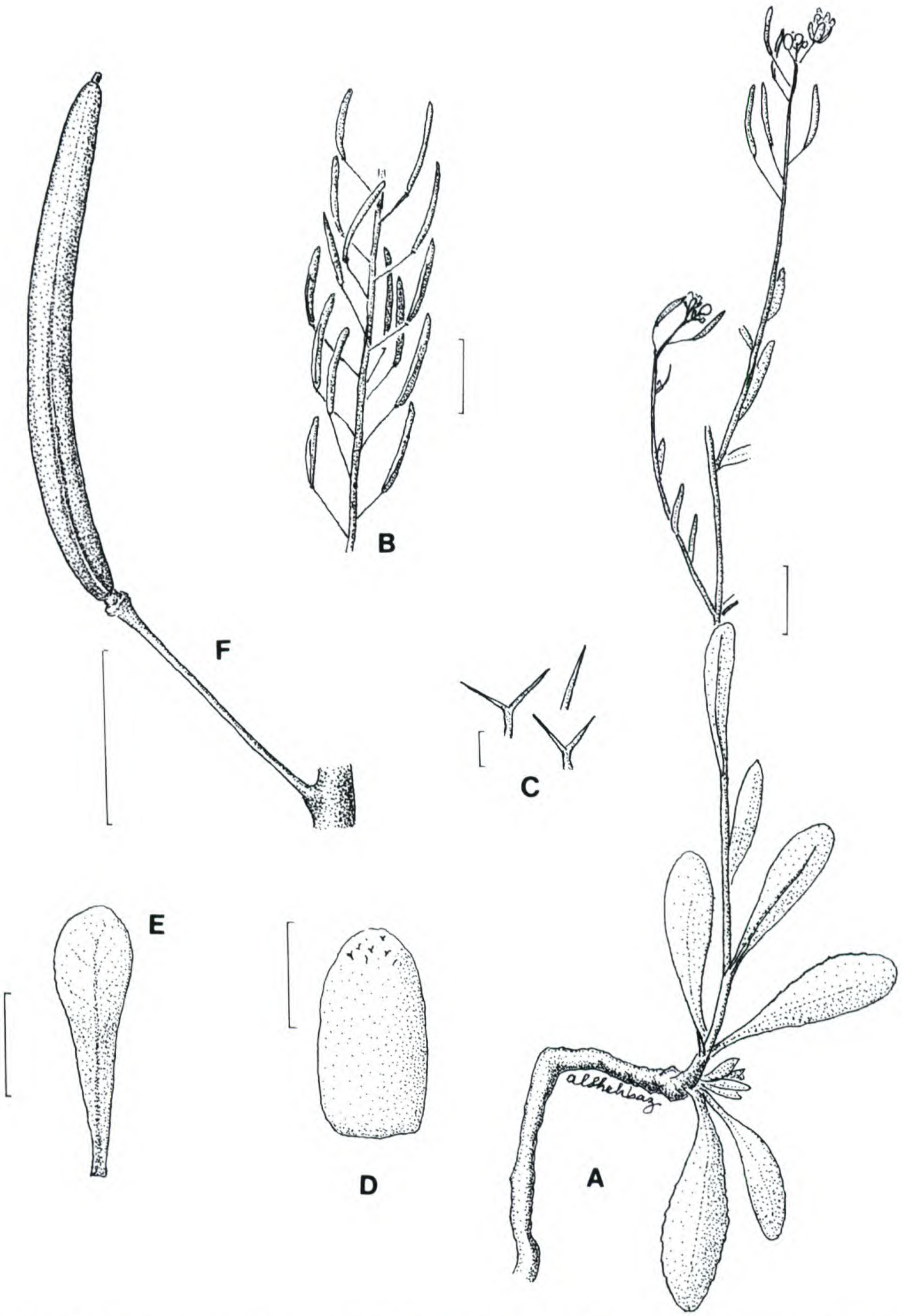

Figure 1. *Pennellia brachycarpa* Beilstein & Al-Shehbaz. —A. Plant. —B. Portion of infructescence. —C. Trichomes. —D. Sepal. —E. Petal. —F. Fruit. Scale: A, B, D, E = 1 mm; C = 0.1 mm; F = 5 mm. Drawn by Al-Shehbaz from the holotype (*Beilstein, Whiteman & Eakman 03-148*, MO).

Pennellia brachycarpa, which is known only from the holotype specimen, is easily distinguished from the other species of *Pennellia* by having corymbose instead of lax racemes and forked and Y-shaped instead of dendritic trichomes. It is related to a group of four species (the South American *P. boliviensis* and the North American *P. patens* (O. E. Schulz) Rollins, *P. micrantha* (A. Gray) Nieuwland, *P. lasiocalycina* (O. E. Schulz) Rollins) with terete to subterete, ascending to erect fruits (Fuentes-Soriano, 2004). From these, *P. brachycarpa* is also distinguished by its shorter (1.3–1.7 cm) instead of longer (more than 2 cm) fruits.

Ongoing studies on the South American genera of Brassicaceae should clarify generic boundaries and establish relationships among and within genera.

Acknowledgments. We are grateful to Victoria C. Hollowell and two anonymous reviewers for their comments on the manuscript. We thank Sandra Aliscioni for help in the field.

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Inga colonchensis (Fabaceae, Mimosoideae), una Nueva Endémica del Bosque Seco Tropical en Ecuador

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Resumen. Se describe *Inga colonchensis* como un nuevo taxón del fragmentado bosque seco tropical de la cordillera Chongón-Colonche (Prov. Guayas), en la región occidental del Ecuador. Por su inflorescencia capituliforme y estructuras florales de muy pequeñas dimensiones, subglabras, esta especie se coloca en la sección *Leptinga*. La nueva especie es similar a *I. allenii* de Costa Rica y Panamá, de la que difiere principalmente por tener nectarios foliares doliiformes vs. claviformes, fruto más pequeño, con ápice obtuso vs. rostrado y foliolos con mayor número venas secundarias por lado, 14–19 vs. 6–8, respectivamente.

Abstract. *Inga colonchensis* is described from fragmented tropical dry forest in the cordillera Chongón-Colonche, Guayas Province, western Ecuador. It is placed in section *Leptinga* on account of the capituliform inflorescence and very small subglabrous flowers. This new species is similar to *I. allenii* from Costa Rica and Panama but differs in its barrel-shaped foliar nectaries, smaller fruits with obtuse apex, and higher number of lateral veins per side.

Key words: tropical dry forest (bosque seco tropical), Ecuador, endemic, *Inga colonchensis*, section *Leptinga*.

Inga Miller (Fabaceae–Mimosoideae) es un género que comprende aproximadamente 300 especies, ampliamente distribuidas en América, desde 24°N en Méjico hasta 34°S en Uruguay, incluyendo las Antillas (Pennington, 1997). En Ecuador se han registrado 75 especies, distribuidas en bosques secos y húmedos, desde las zonas bajas a ambos lados de los Andes hasta el bosque montano andino (Pennington & Revelo, 1997; Cornejo, obs. pers.). Este género ha sido dividido en 14 secciones, entre las cuales *Leptinga*, se caracteriza por presentar: (1) pubescencia finamente pubérula o subglabra, (2) nectarios foliares casi siempre sésiles, (3) inflorescencias capitadas o umbeladas, (4) flores glabras o pubérulas de pequeñas dimensiones, (5) estambres de 1–2 cm de largo, en número de 20–50, (6) ovario 1-carpelado y (7) legumbre plana a convexa con los márgenes angostos, no expandidos (Pennington, 1997).

Durante la fase de campo para la elaboración de la *Flora del Bosque de Garúa de la comuna Loma Alta* (Bonifaz & Cornejo, 2004), en las márgenes de los ríos localizados en las partes bajas de la cordillera Chongón-Colonche, encontramos una especie que presenta las características de *Leptinga*, la misma que es distinta de las 30 especies de esta sección que se encuentran en la región occidental de América del Sur y de las 11 especies registradas en América Central. Esta es descrita a continuación.

Inga colonchensis X. Cornejo & C. Bonifaz, sp. nov. TIPO: Ecuador. Guayas: Cordillera Chongón-Colonche, Comuna Loma Alta, Río seco, 1°46′S, 80°40′O, 200 m, 29 May 1999 (fl), *X. Cornejo & C. Bonifaz 6858* (holotipo, GUAY; isotipos, AAU, COL, GB, LOJA, MO, QCA, QCNE). Figura 1.

Haec species *Ingae allenii* affinis, a qua differt glandulis extra rhachiales, nectariis interfoliolaribus doliiformibus, venis lateralibus majoribus, legumine apice obtuso.

Árbol hasta 6 m alto; ramas abundantemente lenticeladas, las terminales cilíndricas hasta algo anguladas, longitudinalmente canaliculadas; brotes jóvenes (sub)cilíndricos hasta subangulados, a veces algo complanados, adpreso-pubérulos; estípulas 7–9 mm, oblongas hasta oblanceoladas, glabras o adpreso-pubérulas, caducas. Glándulas extra-raquiales dispuestas antes de las bases de los pecíolos y de los pedúnculos de las inflorescencias. Pecíolo 1.7–4 cm (sub)cilíndrico, glabro; raquis 2.5–12.3 cm, alado hasta ampliamente alado (2 cm), en la mitad o hasta dos tercios superiores del entrenudo, glabro; el apéndice ausente; nectarios foliares doliiformes con pequeña apertura circular, 0.8–1.3 mm; peciólulo 2–3 mm; folíolos (2–)3 pares; par terminal 10–28 × 3.2–11.1 cm, elíptico a angosto obovado, el ápice acuminado hasta 1.5 cm, base atenuada; par basal 4.7–12.5 × 1.8–6 cm, elíptico,

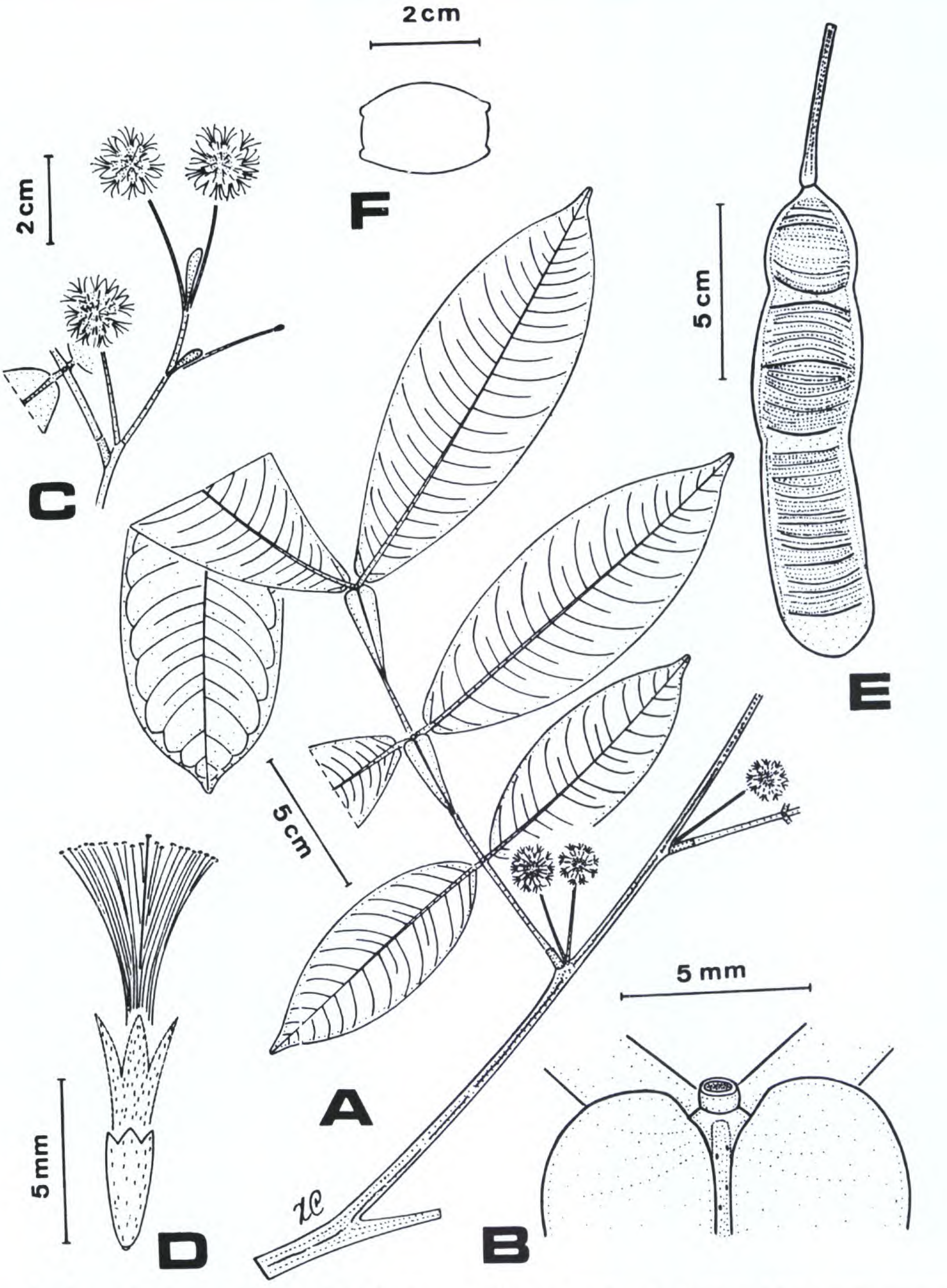

Figura 1. *Inga colonchensis* X. Cornejo & C. Bonifaz. —A. Rama florecida. —B. Nectario foliar y parte superior adyacente del raquis alado. —C. Inflorescencias terminales. —D. Flor. —E. Legumbre madura. —F. Sección de la legumbre. (A–D: Dibujo del holotipo, *Cornejo & Bonifaz 6858*; E, F: *Cornejo & Bonifaz 5801*.)

el ápice acuminado, la base atenuada; raramente un poco obtusa; haz opaco, glabro; envés con muy cortos pelos adpreso-pubérulos o glabro; venación eucamptódroma; 14–19 pares de venas secundarias arcuadas, venación terciaria perpendicular o débilmente reticulada. Inflorescencias capituliformes, solitarias o geminadas, terminales, axilares o ramifloras; pedúnculo 2–3.3 cm, adpreso-pubérulo; raquis floral 1.5–2.5 × 1–1.3 mm, clavado; brácteas 1–1.7 mm, espatuladas, caducas; flores sésiles; cáliz abierto en prefloración, el tubo 1.5–2 mm, los lóbulos 0.2–0.3 mm, adpreso-pubérulo; el tubo de la corola 4–5.5 mm, los lóbulos 1–1.5 mm, adpreso-pubérulo; estambres ca. 20–35, tubo estaminal 3–5 × 0.4 mm, incluido o apenas exserto, filamentos libres, 5–6 mm; ovario de 1 carpelo, glabro, el estilo 9–10 mm. Legumbre madura (5–)11–16 × 2–2.8 × 0.8–1.5 cm, recta, el ápice y la base obtusos, las superficies ligeramente convexas, apenas hinchadas sobre las semillas, con débil venación transversa, margen 4–6 mm, blanquecino, con abundantes lenticelas de color blanco, glabra.

Dentro de la sección *Leptinga*, *Inga colonchensis* es afín a la centroamericana *I. allenii* J. León de Costa Rica y Panamá (León, 1966; Pennington, 1997), la cual presenta similar estructura de la inflorescencia, las dimensiones florales, la abertura de sus nectarios foliares, el número y forma de los folíolos; pero difiere de ésta por tener nectarios foliares doliiformes vs. claviformes, fruto con ápice obtuso vs. rostrado, de menor longitud, (5–)11–16 vs. 19–24 cm, folíolos con 14–19 vs. 6–8 venas laterales por lado, con ápices acuminados vs. caudado-acuminados; en vivo, los márgenes del fruto y las lenticelas son blancas vs. café y se observan distintivas glándulas extra-raquiales dispuestas antes de las bases de los pecíolos y de los pedúnculos de las inflorescencias, siendo difícil de apreciar esta última característica en material seco. También es parecida a *Inga jinicuil* G. Don, distribuida desde México hasta el bosque muy húmedo del noroccidente de Ecuador, de la cual difiere por tener raquis alado vs. no alado, apéndice ausente vs. presente, de 4–7 mm de largo y legumbre más angosta, 2–2.8 vs. 6–7 cm de ancho, con base simétrica vs. fuertemente asimétrica. Entre las especies de *Leptinga* de América del Sur, *Inga colonchensis* es parecida a *I. umbratica* Poeppig & Endlicher, ampliamente distribuida en el bosque muy húmedo de la amazonía, desde el sur de Venezuela hasta Bolivia, de la cual difiere en cuanto a su fitogeografía, zona de vida y morfológicamente por presentar nectarios foliares doliiformes más angostos, de 0.8–1.3 mm de diámetro vs. planos o pateliformes, 2–3 mm de diámetro; folíolos con base atenuada vs. cordada hasta truncada; raquis de la hoja glabro vs. densamente pubérulo; raquis floral clavado vs. globoso; flores con pedicelos ausentes vs. presentes, de 0.75–5 mm de largo y el tubo estaminal 3–5 mm vs. 9–11 mm de longitud.

Ecología y distribución. *Inga colonchensis* se encuentra en las márgenes de los ríos de la cordillera costera Chongón-Colonche, entre 130–250 m s.n.m. La base de la mencionada cordillera está constituida por rocas básicas pertenecientes a un complejo volcano-sedimentario del período cretácico. Su zona de vida corresponde a la formación vegetal de bosque seco tropical con vegetación caducifolia, adaptada a períodos secos de aproximadamente seis meses de duración.

Fenología. Esta especie florece en febrero, mayo y junio, fructifica en julio hasta fines de octubre.

Interacciones biológicas. Las flores son visitadas por hormigas y abejas durante el día.

Etimología. El nombre propuesto para esta nueva especie se debe a la cordillera costera Chongón-Colonche y a su gente, la misma que rescató vivo al segundo autor en el accidente aéreo de 1993 en el que falleció A. H. Gentry.

Uso. De las poblaciones silvestres existentes, los habitantes de Loma Alta ocasionalmente comen sus frutos. Se dice que los monos también lo comen, a lo que debe uno de sus nombres locales ("Guaba de mono"). La suave pulpa blanca que recubre las semillas tiene un sabor dulce y agradable al madurar, sin embargo esta especie no ha sido domesticada.

Nombres locales. "Guaba", "Guaba de mono".

Paratipos. ECUADOR. **Guayas:** Cordillera Chongón-Colonche, La Bramona, bosque seco tropical, 130 m, 9 Jul. 1995 (fr), *X. Cornejo & C. Bonifaz 4205* (GB, GUAY, K); Cordillera Chongón-Colonche, Comuna Loma Alta, lecho de río California, bosque seco tropical, formación de lecho de río, 150 m, 27 Sep. 1997 (fr), *X. Cornejo & C. Bonifaz 5801* (GB, GUAY, K); microhábitat húmedo, 7 Feb. 1999 (fl), *X. Cornejo & C. Bonifaz 6756* (GUAY).

Agradecimientos. El cabildo de la Comuna Loma Alta nos otorgó el permiso de colección respectivo; el comunero Celso Tomalá nos brindó el hospedaje y los comuneros Mauricio, Félix y Wilson Tomalá fueron nuestros guías de campo. T. D. Pennington (K) revisó el paratipo *X. Cornejo & C. Bonifaz 4205.* Los herbarios visitados son: AAU, K, MO, NY, QCNE. La fundación GAIA financió parcialmente los gastos de la fase de campo.

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A New Species of *Hypericum* (Clusiaceae) from Shaanxi Province, China

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ABSTRACT. The new species *Hypericum qinlingense* (Clusiaceae) is described and illustrated from the southern slope of Mount Qinling in Shaanxi Province, China. The new species belongs to *Hypericum* sect. *Adenosepalum* by its glabrous, perennial, herbaceous habit, persistent perianth and androecium, sepals with large stalked black glands, three bundles of stamens, and three free styles, as well as by the alveolate seeds. The new species is similar to *Hypericum elodeoides* Choisy in its scorpioidal dichasium, but differs in its bracts and flowers. A key to the Chinese species of *Hypericum* sect. *Adenosepalum* is included.

Key words: China, Clusiaceae, *Hypericum* sect. *Adenosepalum*, Shaanxi Province.

The genus *Hypericum* L. (Clusiaceae) consists of more than 400 species and is cosmopolitan except for the Polar Region. There are 8 sections, 55 species, and 8 subspecies of *Hypericum* in China, mainly in the southwest region (Li et al., 1990). The new species belongs to *Hypericum* sect. *Adenosepalum* Spach, which consists of 34 species (Li et al., 1990); 7 occur in China: *H. filicaule* (Dyer) N. Robson, *H. monanthemum* Hooker f. & Thomson ex Dyer, *H. wightianum* Wallich ex Wight & Arnott, *H. himalaicum* N. Robson, *H. elodeoides* Choisy, *H. hengshanense* W. T. Wang, and the new species.

Hypericum qinlingense X. C. Du & Y. Ren, sp. nov. TYPE: China. Shaanxi: Yangxian, Huayang, Xinglongling, 33°41′73″N, 107°35′94″E, 2450 m, 3 July 2001, ETNWU (Expedition Team of Northwest University) *40053* (holotype, SANU). Figure 1.

Haec species *Hyperico elodeoidi* similis, sed ab eo bracteis base glandulis nigris stipitatis praeditis, sepalis petalisque minoribus, staminibus in quoque fasciculo paucioribus, filamentis brevioribus atque stylo longitudine ca. tertiam partem ovarii aequante differt.

Herbs perennial, 30–40 cm high; stems 1 to several from basal rosette, cylindrical, glabrate, with inconspicuous glandular spots and vertical long glandular stripes, internodes 1–4.5 cm long. Leaves stiffly papyraceous, elliptic to obovate, 1.3–2.9 × 0.5–1 cm on main stems, 6–10 × 2–3 mm on branches, with small light glands on the surface and larger black glands near the edge, slightly retuse or obtuse at apex, the margin entire and revolute, cuneate at the base and tapering into a petiole about 1 mm long, green on upper surface and light green below. Inflorescence a terminal scorpioidal dichasium, bracts lanceolate, 3–5 mm long, ca. 1 mm wide, with stalked black glands at the base of the back and the edge. Flowers yellow, ca. 8 mm diam.; perianth persistent; sepals 5, lanceolate, 3–4 mm long, ca. 1 mm wide, with yellow-brown vertical glandular stripes and occasional black stalked glands at the edge; petals 5, linear, 4–6 mm long, ca. 1 mm wide, with black glands at the apex and yellow-brown vertical glandular stripes; androecium persistent, with three stamen groups of 10 to 12 each, filaments ca. 4 mm long, anthers yellow, ca. 0.1 mm long, with longitudinal slit, with black glands at the connective; carpels 3, united, ovary ovoid, ca. 4 × 3 mm, with axial placentation, styles 3, 1–1.8 mm long, ca. ⅓ length of the ovary, with occasional black glands on stigma. Capsules ovoid, with septicidal dehiscence, ca. 5 mm diam., with yellow-brown glands, with ca. 180 seeds inside. Seeds ca. 0.6 mm long, alveolate.

Habitat and distribution. The new species occurs on exposed slopes and in secondary forest, as well as roadsides, ranging from 1320 to 2450 m elevation. The primary vegetation of the area is deciduous broadleaved forest consisting of species of *Quercus* L. or temperate coniferous and broadleaved mixed forest composed of species of *Betula* L. and *Abies* Miller.

The new species is known only from Yangxian County of Shaanxi Province, China. Yangxian County is located in the middle of the southern slope of Mt. Qinling.

The new species belongs to *Hypericum* by its herbaceous habit, yellow flowers without glands be-

Figure 1. *Hypericum qinlingense* X. C. Du & Y. Ren. —A. Plant. —B. Dorsal view of leaf. C, D. Bracts. —C. Dorsal view. —D. Ventral view. —E. Flower. —F. Petal. —G. Stamens. —H. Capsule with persistent sepals and styles and with petals and stamens removed. —I. Seed. Scale bars: A = 2 cm; B = 5 mm; C, D = 1 mm; E = 5 mm; F = 1 mm; G = 1 mm; H = 2 mm; I = 0.2 mm. Drawn by Guo Mu-seng from the holotype, *ETNWU 40053*.

tween the stamen groups, stamens basally united into three groups, septicidal capsules, and seeds without wings.

There are eight sections of *Hypericum* in China (Li et al., 1990). *Hypericum qinlingense* is readily distinguished from the related Chinese species in section *Adenosepalum* by its stalked black glands at the base of the back of the bracts, sepals ca. 3–4 × 1 mm, petals 4–6 × ca. 1 mm, stamens basally adnate in 3 groups of 10 to 12 each, filaments ca. 4 mm long, and 3 carpels with 3 styles 1–1.8 mm long, ca. ⅓ of ovary length.

Hypericum qinlingense is similar to *H. elodeoides* in its scorpioidal dichasium, but differs from the latter in its bracts with black stalked glands at the base, smaller sepals and petals, fewer stamens per bundle, shorter filaments, and much shorter styles that are only about ⅓ of the length of the ovaries. The new species may be contrasted with six other species of *Hypericum* known to occur in China in the following key.

KEY TO *HYPERICUM* SECT. *ADENOSEPALUM* FROM CHINA

1a. Inflorescence a scorpioidal dichasium.
  2a. Bracts with stalked black glands at the base of the back and the edge; sepals ca. 3–4 × 1 mm; petals 4–6 × ca. 1 mm; stamens basally adnate in 3 groups of 10 to 12 each, filaments ca. 4 mm long; 3 carpels with 3 styles, styles 1–1.8 mm long ca. ⅓ of ovary length . . . . . *H. qinlingense*
  2b. Bracts lacking glands; sepals ca. 6 × 3 mm; petals ca. 15 × 4 mm; stamens basally adnate in 3 groups of 20 each, filaments ca. 0.8–1.1 cm long; 3 carpels with 3 styles, styles at least twice ovary length . . . . . *H. elodeoides*
1b. Inflorescence a single flower or aggregate inflorescence, not scorpioidal dichasia.
  3a. Sepals 4 . . . . . *H. filicaule*
  3b. Sepals 5.
    4a. Style 1.4–7 times longer than ovary, exserted from flower . . . . . *H. hengshanense*
    4b. Style shorter than or not exceeding the ovary, inserted within flower.
      5a. Flowers to 2 cm diam . . . . . *H. monanthemum*
      5b. Flowers less than 1.5 cm diam.
        6a. Annual herbs, with black stalked glands on leaf margins . . . . . *H. wightianum*
        6b. Perennial herbs, lacking marginal glands . . . . *H. himalaicum*

Paratypes. CHINA. **Shaanxi:** Yangxian, Huayang, Cang'eryan, 26 June 2001, *ETNWU 40055* (SANU), 25 Aug. 2000, *ETNWU WA2-6-23* (SANU); Dongping, 26 Aug. 2000, *ETNWU EK-025* (SANU); Maoping, Pochayu, 27 Aug. 2000, *ETNWU EA-004* (SANU); same locality as type, *ETNWU 10544* (MO).

Acknowledgments. The reviewer, John J. Pipoly III (FTG), and scientific editor, Victoria C. Hollowell (MO), were extremely helpful in clarifying the text; we also thank Roy Gereau (MO) for the Latin diagnosis. This report was supported by State Key Basic Research and Development Plan of China (No. G200004680001).

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Nomenclatural Notes on Three Species of Cactaceae from South America

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ABSTRACT. The names *Cumulopuntia crassicylindrica* (from Peru), *Espostoa guentheri* (from Bolivia), and *Yungasocereus inquisivensis* (from Bolivia) are validated here. All had been previously published, but were invalid under Article 33.3 of the *International Code of Botanical Nomenclature*.

Key words: Cactaceae, *Cumulopuntia*, *Espostoa*, nomenclature, South America, *Yungasocereus*.

In the course of preparing a checklist of accepted names of Cactaceae and their synonyms for use in the forthcoming German translation of Anderson (2001), a number of names have been found to be in "current use" despite the fact that they are not validly published under Article 33.3 of the current *International Code of Botanical Nomenclature* (Greuter et al., 2000).

Failures to meet the requirements for valid publication under Article 33.3 of the *Code* in the context of publishing a new combination are sometimes difficult to establish, and this has been the case for the two names in question, whose combinations were published by F. Ritter: *Yungasocereus inquisivensis* (Ritter, 1980) and *Cumulopuntia crassicylindrica* (Ritter, 1981). Both these names are invalid because of missing page numbers in the basionym reference, but were listed as valid by Eggli and Taylor (1991), who used information from Rowley et al. (1982, 1983). In the case of the attempted combination *Espostoa guentheri* by Buxbaum (1959), its invalid status (because of the missing reference to the basionym) was somewhat cryptically stated (as "comb. subnud.") by Rowley (1961: 16), but was fully indicated by Eggli and Taylor (1991).

In order to validate these names to be available for future use, the necessary combinations are published as follows:

Cumulopuntia crassicylindrica (Rauh & Backeberg) F. Ritter ex Eggli, comb. nov. Basionym: *Tephrocactus crassicylindricus* Rauh & Backeberg, in Backeberg, Descr. Cact. Nov.: 8. 1956 [1957]. TYPE: Peru. Dept. Arequipa: 1956, *W. Rauh K 152* (holotype, HEID not seen).

Cumulopuntia crassicylindrica is a poorly known taxon, presently only reported from Dept. Arequipa, Peru, and seems to be known from the type collection only (Iliff, 2002).

Espostoa guentheri (Kupper) Buxbaum ex Eggli, comb. nov. Basionym: *Cephalocereus guentheri* Kupper, Monatsschr. Deutsche Kakt.-Ges. 3: 161–162. 1931. TYPE: Bolivia. Dept. Chuquisaca: 1927, *C. Troll s.n.* (holotype, M not seen).

Espostoa guentheri is reported from the Bolivian departments of Chuquisaca, Cochabamba, and Santa Cruz (Navarro, 1996). It was described on the basis of photographs and a living stem tip sent to Munich by the collector. It is assumed that the living material was preserved at Munich after having died in cultivation, but this has not yet been verified. In the absence of the specimen, the illustration in the protologue (p. 160) might serve as lectotype.

Yungasocereus inquisivensis (Cárdenas) F. Ritter ex Eggli, comb. nov. Basionym: *Samaipaticereus inquisivensis* Cárdenas, Cactus (Paris) 12(57): 246–247. 1957. TYPE: Bolivia. Dept. La Paz: 1956, *M. Cárdenas 5484* (holotype, BOLV not seen; isotype, US not seen).

Yungasocereus inquisivensis is only known from the Bolivian Department La Paz (Navarro, 1996). The holotype specimen supposedly is at BOLV, as a recent survey (by the author and B. E. Leuenberger) of the Cárdenas Cactaceae specimens at LIL did not locate any material of this collection number. A "cotype" (i.e., isotype) is cited for US in the protologue, but the on-line version of the type specimen list at US does not include an entry for this number.

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Calochortus mendozae (Calochortaceae), una Nueva Especie de San Luis Potosí, México

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RESUMEN. Se describe e ilustra a *Calochortus mendozae* Espejo, López-Ferrari & Ceja, especie conocida hasta ahora del municipio de San Nicolás Tolentino, en el estado de San Luis Potosí, México, en donde crece sobre taludes yesosos, en vegetación de matorrral xerófito. La nueva especie se ubica dentro de la subsección *Ghiesbreghtiani* de la sección *Cyclobothra* del género *Calochortus* y la especie más cercana al nuevo taxon es *C. hintonii* Bullock ex Ownbey, con la cual se compara.

ABSTRACT. *Calochortus mendozae* Espejo, López-Ferrari & Ceja, a new species from the municipality of San Nicolás Tolentino in the state of San Luis Potosí, Mexico, is described and illustrated. The new species grows on gypseous soils in xerophytic scrub. *Calochortus mendozae* is placed in section *Cyclobothra* subsection *Ghiesbreghtiani* and is closely related to *C. hintonii* Bullock ex Ownbey, with which it is compared.

Key words: Calochortaceae, *Calochortus*, San Luis Potosí, Mexico.

Al identificar material de monocotiledóneas proveniente de San Luis Potosí, nos encontramos con un ejemplar del género *Calochortus* Pursh que no pudimos asignar a ninguna de las especies reportadas para México. La revisión cuidadosa de la literatura pertinente y del material, nos permitió establecer que se trata de una especie no descrita por lo que proponemos:

Calochortus mendozae Espejo, López-Ferrari & Ceja, sp. nov. TIPO: México. San Luis Potosí: municipio de San Nicolás Tolentino, 3 km después del Potrero de Santa Gertrudis, rumbo a Buenavista, 22°11′30″N, 100°20′58″W, 1320 m s.n.m., matorral xerófito, 21 Nov. 2002, *A. Mendoza Ruiz 656* (holotipo, UAMIZ; isotipo, MO). Figura 1.

Herba ad 54 cm alta. Caules flexuosi, ramosi, glauci. Folia basalia 1–2, linearia; folia caulina plantae apicem versus gradatim decrescentia. Inflorescentiae axillares, dichotome ramificantes, arcuatae. Flores campanulati, erecti, flavi, tepalis exterioribus ellipticis, apice obtusis, sine glandula, tepalis internis obovatis, basi cuneatis, apice integris vel parum undulatis rotundatisque, basi trichomatibus papillosis, glandula hippocrepiformi in tepali dimidio basali per membranam laciniatam obtecta; antheris oblongis, apice apiculatis; ovario longe elipsoideo, ramis stigmaticis flavis.

Hierbas de hasta 54 cm de alto incluyendo el bulbo, los bulbos globosos a ovoides, de 1.9 cm de largo, de 1.6 cm de diámetro, cubiertos por vainas fibroso-reticuladas, pardas. Tallos erectos, flexuosos, ramificados, glabros, glaucos. Hojas basales 1–2, linear-lanceoladas, de 20–25 cm de largo, de ca. 1.2 cm de ancho, glabras; hojas caulinares similares a las basales en forma, de hasta 18 cm de largo, de 5–10 mm de ancho, reduciéndose gradualmente hacia la porción apical de la planta. Inflorescencias axilares, dicotómicamente ramificadas, arqueadas, las brácteas 3, una de ellas generalmente más pequeña, linear-lanceoladas, largamente acuminadas, de 1.2–3.3 cm de largo por 0.1–0.5 cm de ancho en la base; los pedúnculos lineares, arqueados, estríados, glabros, de 4.5–13 cm de largo; los pedicelos lineares, arqueados, estríados, glabros, con tonalidades rosadas a púrpuras, de 5–7 cm de largo en flor, de 8.5–16 cm en fruto; flores campanuladas, aparentemente nutantes por los pedúnculos y pedicelos algo arqueados pero en realidad erectas; tépalos externos amarillos, elípticos, de 12–16 mm de largo, de 4–5 mm de ancho, enteros, obtusos en el ápice, glabros excepto por unos escasos tricomas presentes en la porción media basal, sin glándulas; tépalos internos amarillos, obovados, cuneados en la base, enteros a ligeramente ondulados y redondeados a laciniados en la porción apical, de 12–14 mm de largo, de 7–10 mm de ancho, glabros excepto en la porción basal en donde presentan tricomas a los lados de la glándula; la glándula en forma de herradura situada en la mitad basal del tépalo, cubierta por una membrana laciniada y con tricomas papilosos; filamentos subulados, amarillos, de 4 mm de largo, de ca. 0.6 mm de ancho en la base, las anteras oblongas, amarillas, de 4–6 mm

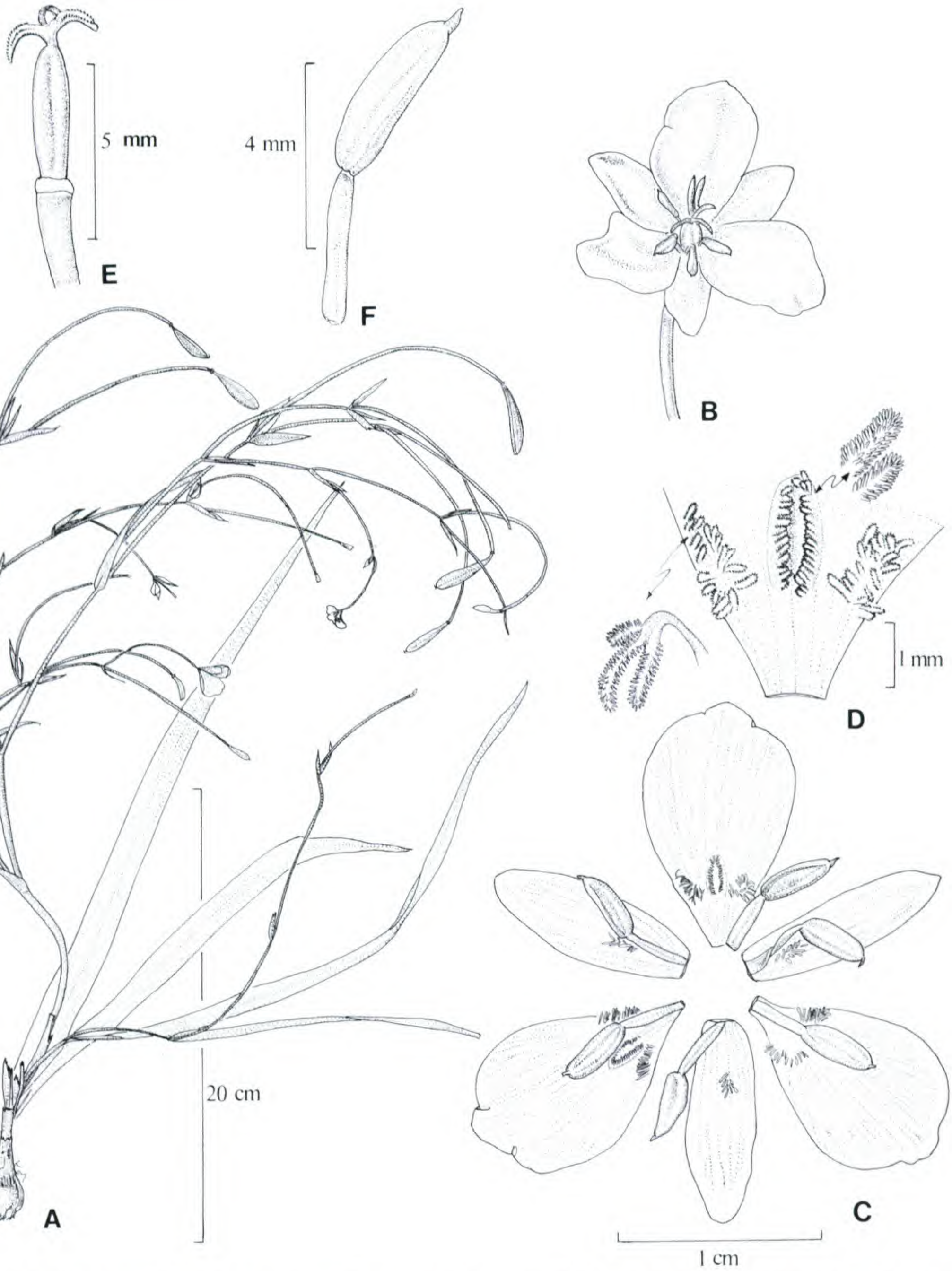

Figura 1. *Calochortus mendozae* Espejo, López-Ferrari & Ceja. —A. Hábito. —B. Flor. —C. Flor disecada. —D. Detalle de la glándula. —E. Gineceo. —F. Estambre. Basado en el holotipo.

de largo, apiculadas en el ápice, el apículo blanco; ovario largamente elipsoide, triangular, de ca. 1 cm de largo, de ca. 2.5 mm de diámetro, glauco, las ramas estigmáticas 3, amarillas, de 2 mm de largo, recurvadas, agudas. Fruto una cápsula largamente elipsoide, triangulada, de 3 cm de largo, de 0.5 cm de diámetro; semillas alargadas, triangulares en corte transversal, de 5 mm de largo, de 1 mm de ancho, con la testa finamente reticulada.

La especie se conoce únicamente de la localidad tipo, en donde crece sobre taludes yesosos, en vegetación de matorral xerófito. *Calochortus mendozae* se ubica dentro del subgénero *Cyclobothra* (Painter, 1911) o la sección *Cyclobothra* (Ownbey, 1940), ya

Tabla 1. Diferencias entre *Calochortus mendozae* y *C. hintonii*.

	Calochortus mendozae	*Calochortus hintonii*
Flores	erectas, campanuladas, de 24 a 32 mm de diámetro, de color amarillo	erectas, ampliamente campanuladas, de 18 a 27 mm de diámentro, de color rojo oscuro, ocasionalmente amarillas
Tépalos externos	elípticos, 12–16 × 4–5 mm, obtusos en el ápice, glabros excepto por unos escasos tricomas presentes en la porción media basal	elíptico-lanceolados, 9–11 × 3.5–5.55 mm, agudos a obtusos en el ápice, barbados cerca de la base
Tépalos internos	obovados, 12–14 × 7–10 mm, redondeados a laciniados en el ápice, glabros excepto en la porción basal a los lados de la glándula; tricomas multiseriados	elípticos a angostamente obovados, 12–13.5 × 5–7.5 mm, obtusos a agudos en el ápice, densamente barbados cerca de la base; tricomas uniseriados
Glándula	en forma de herradura, cubierta por una membrana laciniada y tricomas papilosos	en forma de media luna, densamente cubierta por tricomas no papilosos
Filamentos	subulados, amarillos, de 4 mm de largo	lineares, rojos, de 5 mm de largo
Anteras	oblongas, de 6 mm de largo, apiculadas en el ápice	elípticas, de 1.7 a 3 mm de largo, obtusas a agudas en el ápice
Ovario	ca. 10 mm de largo, verde, glauco; ramas estigmáticas amarillas	6.5–7 mm de largo, verde, glauco; ramas estigmáticas rojas a púrpuras
Hábitat	matorral xerófito, sobre suelos yesosos	bosque de encino o de pino-encino, sobre suelos ricos en materia orgánica
Distribución	conocida sólo de San Luis Potosí	endémica del estado de México

que presenta bulbos cubiertos por catáfilas fibroso-reticuladas y cápsulas alargadas y trianguladas y pertenece a la subsección *Ghiesbreghtiani*, que agrupa especies con los tallos flexuosos, raramente bulbíferos en las axilas de las hojas caulinares y flores pequeñas y erectas con los tépalos inconspicuamente barbados (Ownbey, 1940). El nuevo taxon presenta flores aparentemente similares a las de *C. hintonii* Bullock ex Ownbey, especie endémica del Estado de México que también se ubica en la subsección *Ghiesbreghtiani* (Apéndice 1), de la que además se conoce una variedad de flores amarillas. Sin embargo, existen diferencias claras entre ambas especies, como puede apreciarse en la Tabla 1.

El nombre de la especie está dedicado al M. en C. Aniceto Mendoza Ruiz, colega y amigo de la Universidad Autónoma Metropolitana Iztapalapa, compañero de numerosos viajes de colecta, quien hizo el hallazgo del nuevo taxon.

Agradecimientos. Los autores agradecen a los Dres. Fernando Chiang Cabrera y Abisaí García Mendoza, la revisión crítica del manuscrito y al primero de ellos la elaboración de la diagnosis latina de la nueva especie. La figura que acompaña al trabajo fue realizada por Rolando Jiménez Machorro.

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Apéndice 1. Material revisado de *Calochortus hintonii* Bullock ex Ownbey. MÉXICO. **Estado de México:** Municipio de Tejupilco de Hidalgo, 5 km antes de la desviación a Almoloya de las Granadas, por el camino Temascaltepec–Tejupilco, *A. Espejo, A. R. López-Ferrari & A. Flores C. 3396* (UAMIZ); Municipio de Tejupilco de Hidalgo, alrededores de Rincón de Ugarte, Tejupilco, *A. Espejo, A. R. López-Ferrari & I. Reyes J. 5537* (UAMIZ); Municipio de Tejupilco de Hidalgo, 1 km sobre el camino a Almoloya de las Granadas, a partir de la carretera Temascaltepec–Tejupilco, *A. Flores C., A. R. López-Ferrari & A. Espejo 985* (UAMIZ), *986* (UAMIZ); Municipio de Tejupilco de Hidalgo, Cerro Muñeca, *G. Hinton 1383* (MO, GH, NY, US); Municipio de Tejupilco de Hidalgo, 7 km después de Tejupilco, rumbo a Temascaltepec, *A. R. López-Ferrari, A. Espejo & I. Reyes J. 2335* (UAMIZ); Municipio de Tejupilco de Hidalgo, "Rancho Quieto", Rincón de Ugarte, Tejupilco, *I. Reyes J. 48* (UAMIZ); Municipio de Tejupilco de Hidalgo, 7 km adelante de Temascaltepec, rumbo a Tejupilco, 500 m antes de la desviación a San Simón, *J. Santana C. 113* (UAMIZ).

Ditassa obscura (Apocynaceae: Asclepiadoideae, Asclepiadeae), a New Combination from Minas Gerais State, Brazil

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ABSTRACT. *Ditassa obscura* (E. Fournier) Farinaccio & T. U. P. Konno (Apocynaceae: Asclepiadoideae, Asclepiadeae), a new combination from Minas Gerais State, Brazil, is proposed, and its relationships are discussed.

Key words: Apocynaceae, Asclepiadeae, Asclepiadoideae, Brazil, *Ditassa*, Minas Gerais, Neotropics.

Ditassa R. Brown is a Neotropical genus of the large tribe Asclepiadeae (Asclepiadoideae, Apocynaceae), containing approximately 100 species (Konno & Fontella-Pereira, 2004). It is one of the most species-rich genera in Brazil, with a center of diversity in the states of Bahia and Minas Gerais (Fontella-Pereira et al., 1987, 1989; Rapini et al., 2001; Farinaccio & Mello-Silva, 2004a).

The genus has a problematic delimitation (Farinaccio & Mello-Silva, 2004a, 2004b), but can usually be recognized by its subaxillary umbelliform cymes and flowers with a double corona, in which the outer segments are united at least at the base.

During the preparation of a monograph of the subfamily Asclepiadoideae for the Serra da Canastra National Park, in the state of Minas Gerais, southeastern Brazil (Farinaccio & Mello-Silva, 2004a), a specimen came to light that exhibited the same set of characters as the type collection of *Metastelma obscurum* E. Fournier. Its clear affinity with *Ditassa tomentosa* (Decaisne) Fontella, especially in relation to floral morphology and also vegetative features such as indument and leaf venation, justify its transfer to *Ditassa* (Fontella-Pereira, 1979). Therefore, we propose the new combination *Ditassa obscura* (E. Fournier) Farinaccio & T. U. P. Konno.

Ditassa obscura (E. Fournier) Farinaccio & T. U. P. Konno, comb. nov. Basionym: *Metastelma obscurum* E. Fournier, in Martius, Fl. Bras. 6(4): 208. 1885. TYPE: Brazil. "In prov. Minarum in Serra de Araxa," s.d., *St. Hilaire C1-449* (holotype, P). Figure 1.

Vines, densely tomentose; leaves opposite, patent; petiole 2–7 mm long, somewhat sulcate, densely tomentose; leaf blade 2–4.7 × 0.6–1.5 cm, elliptic to obovate, apex acute, mucronate, base cuneate, discolorous, opaque, chartaceous, adaxial surface tomentose, abaxially pubescent, margins strongly revolute, venation brochidodromous, midrib abaxially prominent, secondary veins conspicuously parallel, approximately perpendicular to the midrib, 2 to 4 colleters at the base on the adaxial side; inflorescence subaxillary, glomerulate, alternate, 5- to 10-flowered, erect; peduncles 0.3–1 mm long, densely tomentose, bracts 1.1–1.5 × 0.2–0.6 mm, lanceolate, abaxial surface tomentose, adaxial surface glabrous. Pedicel 0.3–0.5 mm long, tomentose. Calyx light green to green, lobes 1.7–2 × 0.55–0.6 mm, lanceolate to ovate, apex acuminate, abaxial surface tomentose, adaxial surface glabrous, with 1 colleter present below each sinus; corolla white to cream, subcampanulate, tube 0.7–0.75 mm long, abaxial surface glabrous, adaxial surface barbellate, glabrous only in the proximal region; lobes 1.5–2 × 0.7–0.95 mm, ovate, erect, recurved from about the middle, apex acute, abaxial surface glabrous, adaxial surface incanous-sericeous, barbellate in the proximal region, margins hyaline; corona white to cream, in 2 series: outer corona with 5 lobes joined at the base or free, not attached to the corolla tube, each lobe 0.64–0.8 × 0.35–0.4 mm, oblong to ovate, asymmetric, apex cuspidate, apiculate to unguiculate, shorter than the gynostegium; inner segments strongly reduced

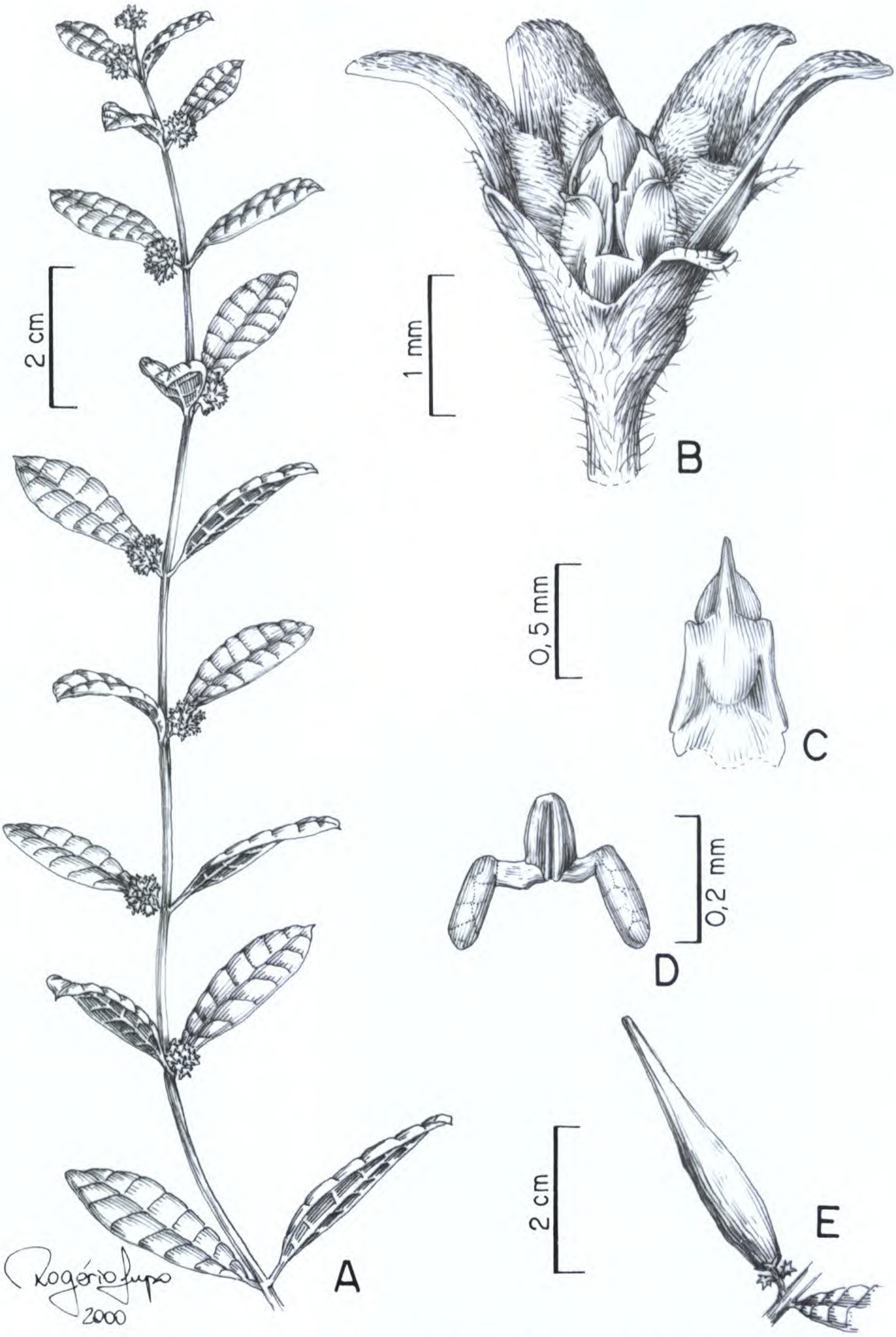

Figure 1. A–E. *Ditassa obscura* (E. Fournier) Farinaccio & T. U. P. Konno. —A. Flowering branch. —B. Flower with one lobe removed showing corona and gynostegium. —C. Abaxial surface of anther. —D. Pollinarium. —E. Fruit. (A from *Romero, Nakajima, Farinaccio & Roque 4770*, HUFU, SPF; B–E from *Farinaccio & Campos Filho 273*, BHCB, F, G, HRCB, K, MBM, MO, NY, RB, SPF.) Drawn by Rogério Lupo.

to absent; gynostegium cream, 0.8–1.1 mm long, 0.6–0.64 mm diam., sessile, cylindrical, apex capitate; anthers 0.4–0.52 × 0.32–0.36 mm, rectangular, gibbous, terminal appendage 0.35–0.4 × 0.16–0.24 mm, ovate, strongly acuminate, wings straight, longer than the dorsum; corpusculum 0.07–0.12 × 0.05–0.06 mm, ovate to conical, apex rounded, translator arms 0.03–0.05 mm long, flattened, broad, translucent, pollinia 0.14–0.16 × 0.05–0.07 mm, oblong to elliptic; fruit a single follicle, immature green to dark purple, 3.8–4 × 0.3–0.4 cm, oblong-lanceolate, hirsute; seeds 5–5.5 × 2–2.5 mm, ovate, comose at the micropylar end.

Habitat and distribution. *Ditassa obscura* occurs at the borders of small forest patches ("capões"), in gallery forests, and in grasslands with stony sandy soil.

Phenology. Flowering from October to November and from April to May; fruiting from March to May.

Ditassa obscura forms a complex with *D. tomentosa*, *D. cipoensis* (Fontella) Rapini, *D. itambensis* Rapini, *D. longicaulis* (E. Fournier) Rapini, and *D. longisepala* (Hua) Fontella & E. A. Schwarz (Table 1). It has bullate leaves like *D. longisepala*; nevertheless, its floral morphology and the shape and color of the leaves are distinctive. Also, *D. obscura* is very similiar to *D. tomentosa*, but the corolla lobes of *D. tomentosa* are twice as long as those of *D. obscura* (Table 1). Moreover, *D. obscura* has bullate leaves and much shorter peduncles and pedicels (Table 1) so that the inflorescences are almost sessile, densely clustered, and glomerulate.

Specimens examined. BRAZIL. **Minas Gerais:** São Roque de Minas, Par. Nac. da Serra da Canastra, Rio do Peixe, próximo à área de desenvolvimento, *Farinaccio & Campos Filho 273* (BHCB, F, G, HRCB, K, MBM, MO, NY, RB, SPF), *Farinaccio, Campos Filho & Vecchi 281* (CESJ, CTES, ESA, HUEFS, SPF): 20°15′27.8″S, 46°24′55.9″W, *Farinaccio, Pontes, Magenta & Magenta 514* (B, BHCB, ESA, G, SP, SPF); próximo à trilha para a Casca d'Anta, parte de cima, *Farinaccio & Pontes 516* (BR, FUEL, INPA, M, P, S, SP, SPF, U, UEC); base do morro próximo à sede admin. Nakajima, *Romero, Zanini & Simão 1483* (HUFU, SPF); margens do Rio São Francisco, *Romero, Nakajima & Guilherme 967* (HUFU, SPF); Córrego dos Passageiros, *Romero, Nakajima & Farinaccio 4179* (HUFU, SPF); Chapadão da Zagaia de frente para a Serra das Sete Voltas, após torre de observação, *Romero, Nakajima, Farinaccio & Roque 4770* (HUFU, SPF).

Acknowledgments. This work is part of a master's thesis by the first author, prepared under the supervision of Renato Mello-Silva at the Universidade de São Paulo. We are grateful to Rosana Romero and Jimi Nakajima, coordinators of the Flora of Serra da Canastra Project. Both authors

Table 1. Comparison of the shape and length (mm) of structures in the *Ditassa tomentosa* complex.

Character	*D. cipoensis*	*D. itambensis*	*D. longicaulis*	*D. longisepala*	*D. obscura*	*D. tomentosa*
Petiole	2.0–7.0	4.0–11.0	2.0–5.0	1.0–4.0	2.0–7.0	2.0–4.0
Peduncle	0.5–1.5	2.0–4.0	0.5–1.0	2.0–2.5	0.3–1.0	0.5–2.0
Pedicel	1.0	1.7–2.0	1.2–1.5	1.5–2.0	0.3–0.5	1.0–3.0
Calyx lobes	2.1–2.3	2.7–3.0	2.0–2.5	3.0–4.5	1.7–2.0	1.5–2.5
Corolla lobes	1.6–2.3	2.5–2.7	3.0–3.2	2.5–3.0	1.5–2.0	3.0–5.0
Corolla tube	1.0–1.6	0.7–1.0	0.8–1.0	1.5–2.0	0.70–0.75	1.0–1.3
Gynostegium	conical, sessile	conical, subsessile	conical, subsessile	cylindrical, subsessile	cylindrical, sessile	cylindrical, sessile
Outer corona segments	subrectangular, shorter than gynostegium	oval, apex acuminate, shorter than gynostegium	linear, higher than gynostegium	ovate, apex acuminate, shorter than gynostegium	oblong to ovate, apex cuspidate, apiculate to unguiculate, shorter than gynostegium	ovate, apex dentate, shorter than gynostegium
Inner corona segments	absent	absent	absent	absent	strongly reduced to absent	strongly reduced to absent

have been supported by FAPESP and CNPq (MAF). Special thanks to the Margaret Mee Foundation, which sponsored the visit of TUPK to the Muséum National d'Histoire Naturelle, in Paris. The line drawings were prepared by Rogério Lupo.

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Crotalaria mwangulangoi (Fabaceae, Faboideae), a New Species from the Udzungwa Mountains, Tanzania

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ABSTRACT. We describe and illustrate the new species *Crotalaria mwangulangoi* (Fabaceae, Faboideae) from the Udzungwa Mountains of south-central Tanzania and compare it with the morphologically similar species *C. hemsleyi* from the Nguru and Uluguru Mountains of eastern Tanzania.

Key words: *Crotalaria*, Fabaceae, Faboideae, Tanzania, Udzungwa Mountains.

Crotalaria L. (Fabaceae, Faboideae) is a genus of ca. 600 species found throughout the tropics and subtropics (Polhill, 1982), with the greatest concentration of species in eastern and southern tropical Africa. Furthermore, it is the largest genus of vascular plants in tropical Africa (Polhill, 1982). With more than 200 species now known from Tanzania, Kenya, and Uganda, it is also the largest genus in the area covered by the *Flora of Tropical East Africa* (Polhill, 1971; Beentje, pers. comm.).

Together with other digitately 3(to 11)-foliolate genera of Fabaceae subfamily Faboideae, *Crotalaria* has variously been treated as part of the largely north temperate tribe Genisteae (Adanson) Bentham (e.g., Wilczek, 1953; Polhill, 1971) or the primarily tropical tribe Crotalarieae Hutchinson (e.g., Polhill, 1976, 1982; Van Wyk & Schutte, 1995; Du Puy & Labat, 2002). *Crotalaria* may be distinguished from the other genera of Faboideae in tropical East Africa by the following combination of characters (Gillett et al., 1971): leaves usually digitately 3(to 7)-foliolate, sometimes simple or unifoliolate; stipels lacking; leaflets entire; calyx not spathaceous; keel beaked, not helically coiled; stamens united; filaments not expanded beneath anther; anthers alternately long and short; legume usually inflated.

The Udzungwa Mountains National Park, gazetted in 1992, protects approximately 20% of the whole Udzungwa Mountains, which form the southern end of the Eastern Arc Mountains of Kenya and Tanzania (Luke & Beentje, 2003). Recent botanical inventories in Udzungwa Mountains National Park reveal the presence of a new species of *Crotalaria* apparently allied to another species from adjacent parts of the Eastern Arc Mountains.

Crotalaria mwangulangoi Gereau & Bodine, sp. nov. TYPE: Tanzania. Iringa Region: Iringa Rural Distr., Udzungwa Mountains National Park, grassland, 7°37′47″S, 36°36′58″E, 1600 m, 10 Sep. 1999, *N. A. Mwangulango, A. H. Seki & G. Leliyo 402* (holotype, NHT; isotypes, GRA, K, MO, S). Figure 1.

Haec species quoad stipulas non foliaceas, folia trifoliolata, foliola utrinque pubescentia, bracteas elongatas persistentes, calycem contra pedicellum deflexum dimidium longitudinis carinae non attingentem, carinam prope medium rotundatam, rostrum non tortum atque legumen subsessile trichomatibus patentibus vestitum ad *Crotalariam hemsleyi* maxime accedit, sed ab ea stipulis longioribus, foliolis late ellipticis, bracteolis prope medium pedicelli insertis, alis carina brevioribus, rostro longiore atque legumine majore facile distinguitur.

Shrub to 1 m tall; branches very finely ribbed, densely pubescent with fine spreading tawny trichomes. Stipules subulate to setaceous, 2–4 mm long, largely obscured by indumentum; petiole 0.5–1.5 cm long, with fine spreading tawny trichomes; leaves 3-foliolate; leaflets broadly elliptic, obtuse to rounded and often apiculate at apex, broadly cuneate to obtuse at base, the terminal 1.2–2.7 × 0.7–1.7 cm, the laterals 0.7–2.3 × 0.5–1.6 cm, coarsely and somewhat spreading-pubescent on upper surface, densely pubescent on lower surface, with trichomes more spreading and pronounced along nerves. Racemes terminal, 5–12 cm long, with ca. 15 to 30 closely arranged flowers; bracts subulate-caudate, expanded at base, 3–6 mm long, long persistent; pedicels 3–4 mm long at anthesis; bracteoles in middle to upper half of pedicel, filiform, 2–3 mm long. Calyx becoming basally truncate and moderately deflexed against pedicel, the tube 3–4 mm long, pubescent with irregularly arranged mostly spreading brown or reddish brown trichomes, the lobes acuminately triangular, 4–5 mm long; standard subcircular, ca. 1.5 cm long, yellow inside, with maroon lines outside, glabrous outside or with very few white trichomes along mid-

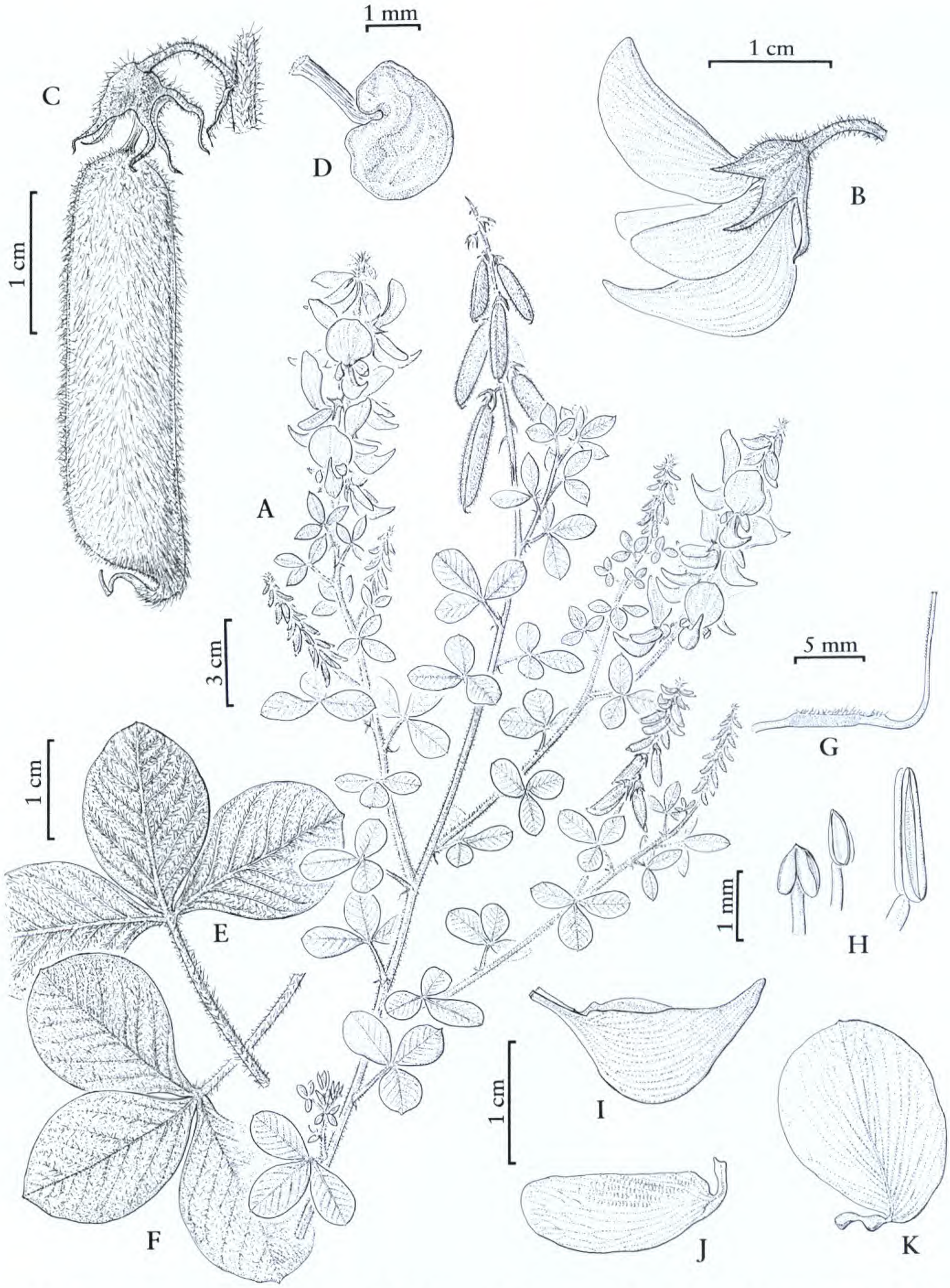

Figure 1. *Crotalaria mwangulangoi* Gereau & Bodine. —A. Flowering and fruiting branch apex, habit. —B. Flower and pedicel, lateral view. —C. Attached fruit with infructescence node. —D. Seed and funicle. —E. Leaf, abaxial surface. —F. Leaf, adaxial surface. —G. Ovary, style, and stigma. —H. Long anther, lateral view, and short anthers, lateral and ventral views. —I. Keel, lateral view. —J. Wing petal, abaxial surface. —K. Standard petal, abaxial surface. Drawn from *Mwangulango et al. 402* (GRA, K, MO, and S isotypes).

rib near apex; wings slightly shorter than keel; keel rather strongly rounded a little below middle, with a slightly incurved, untwisted beak, 1.5–1.6 cm long, lime green with maroon lines. Legume subsessile, cylindrical, rounded at base, 2.7–3.5 × 0.7–1.0 cm, with spreading tawny trichomes ca. 1 mm long outside, glabrous inside, ca. 30-seeded; seeds oblique-cordiform, 2.2–2.6 mm long, smooth, shiny, reddish brown.

Habitat and distribution. Known only from the type collection, in grassland at 1600 m. The recently described *Vernonia luhomeroensis* Q. Luke & Beentje (Asteraceae) was collected within 3 km of *Crotalaria mwangulangoi* and at similar elevations (Luke & Beentje, 2003); however, *V. luhomeroensis* is a species of submontane to montane forest. The recent discovery of two new species in this area demonstrates the need for much more intensive botanical inventory of Udzungwa National Park.

Provisional conservation status. With an Extent of Occurrence (EO) of less than 5000 km² and occurring only in the Udzungwa Mountains National Park, Tanzania, and already listed as potentially threatened (Gereau & Luke, 2003): Endangered (B1ab), using IUCN (2001) criteria.

In the infrageneric classification presented by Polhill (1982), *Crotalaria mwangulangoi* clearly falls within *Crotalaria* sect. *Hedriocarpae* Wight & Arnott subsect. *Macrostachyae* (Bentham) F. A. Bisby & Polhill by the following combination of characters: hypanthium not prominent; calyx less than half as long as keel; standard with maroon lines outside; keel rounded near middle, with untwisted beak; style not dilated nor bifurcate at apex, not geniculate; legume subsessile, rounded at base, glabrous inside, cylindrical. Within this subsection, it is morphologically most similar to *C. hemsleyi* Milne-Redhead, from which it may be distinguished by the following key:

KEY CHARACTERS OF *CROTALARIA HEMLSLEYI* AND *C. MWANGULANGOI*

1a. Stipules ca. 1 mm long; leaflets elliptic, 2.5–7.0 cm long; bracteoles at base of calyx; calyx strongly deflexed against pedicel; wings a little longer than keel; legume 2.5–2.7 × ca. 0.6 cm; seeds 2.5–3.0 mm long . . . . . *C. hemsleyi*

1b. Stipules 2–4 mm long; leaflets broadly elliptic, 0.7–2.7 cm long; bracteoles in middle to upper half of pedicel; calyx moderately deflexed against pedicel; wings slightly shorter than keel; legume 2.7–3.5 × 0.7–1.0 cm; seeds 2.2–2.6 mm long . . . . . *C. mwangulangoi*

The morphologically similar *Crotalaria hemsleyi* is known only from upland grasslands between 1200 and 2000 m in the Nguru and Uluguru Mountains of Tanzania, while *C. mwangulangoi* is known only from the type collection in montane grassland at 1600 m in the Udzungwa Mountains. Lovett (1998) subdivided the Eastern Arc Mountains of Kenya and Tanzania into three subregions: Northern, comprising the Taita Hills, North and South Pare Mountains, East and West Usambaras; Central, comprising the Nguu, Nguru, Ukaguru, Uluguru, and Rubeho Mountains; and Southern, comprising the Udzungwa and Mahenge Mountains. Gereau et al. (in press) document a limited degree of species-level endemism in the Central subregion, to which *Crotalaria hemsleyi* contributes; *C. mwangulangoi* is apparently a sister species to *C. hemsleyi*, endemic to similar habitats in the adjacent Southern subregion.

Acknowledgments. We sincerely thank the WWF Tanzania Programme Office for support of Nathan Mwangulango during his work for the Tanzania Botanical Training Programme, Quentin Luke for alerting us to the publication of *Vernonia luhomeroensis*, John Flanagan of the library at the Royal Botanic Gardens, Kew, for expediting a reprint of that article, and John Myers for another fine illustration.

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A New Synthetic Allopolyploid Naranjilla, *Solanum indianense* (Solanaceae)

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ABSTRACT. The chromosomes of two nearly sterile hybrids (*Solanum quitoense* × *S. sessiliflorum*) have been doubled by colchicine treatment and the resulting tetraploids are described as a new species, *S. indianense*. The parents, now grown in Ecuador under the names Puyo and Palora, are dignified with cultivar status.

RESUMEN. Los cromosomas de dos híbridos casi estériles (*Solanum quitoense* × *S. sessiliflorum*) han sido duplicados mediante tratamiento con colchicina y los tetraploides resultantes se describen como nueva especie, *S. indianense*. Los padres que se cultivan actualmente en Ecuador, bajo los nombres de Puyo y Palora, son reconocidos bajo la categoría de cultivares.

Key words: cocona, Ecuador, hybrid, naranjilla, polyploidy, *Solanum*.

Over 90% of the naranjilla, much esteemed for its fruit juice, grown in Ecuador today comes from the F_1 hybrids *Solanum quitoense* Lamarck × *S. sessiliflorum* Dunal var. *sessiliflorum* and *S. quitoense* × *S. sessiliflorum* var. *georgicum* (R. E. Schultes) Whalen. The former is commonly known under the name Palora and the latter as Puyo from the places where they were first grown in Ecuador. These nearly sterile diploid hybrids are propagated vegetatively. A discussion of their origins may be found in Heiser (1993) and Heiser and Anderson (1999). Both of these hybrids had their chromosomes doubled by colchicine in the greenhouses of Indiana University. The tetraploids, propagated by seed, are described as a new species.

Solanum indianense C. Heiser & J. Soria, sp. nov. [*Solanum quitoense* Lamarck × *S. sessiliflorum* Dunal]. TYPE: U.S.A. Indiana: Bloomington, cultivated in the greenhouse of Indiana University (tetraploid Palora), 15 Feb. 2004, *C. Heiser CP1-1* (holotype, MO; isotypes, IND, QCNE).

Plantae hybrido *Solano quitoensi* × *S. sessilifloro* similes sed prope omnibus partibus majoribus; pollinis grana diametro 26–28 μm; 60% vel plus tingibilia; frutus 60–seminalis vel plus, seminibus plus quam 3.0 mm longis; chromosomatum numerus tetraploideus (n = 24).

Lignescent perennials 1.5–2.8 m high, unarmed, vegetative parts green, rarely with red or purple tinges; stems woolly, with sessile to stalked stellate trichomes (stellae), stalks 1–6 mm, lateral rays 5 to 9, 0.4–11.7 mm long, midpoints shorter than or nearly equaling rays. Leaves felty-pubescent, very large, blades to nearly 1 m long, broadly ovate, repand, cordate at base with 5 to 7 major veins on either side; the repand margins with 5 to 6 deltoid, acute- or obtuse-tipped lobes at lateral vein terminations; interlobal sinuses often with 1 to 3 smaller, tooth-like lobes; adaxial leaf surface with mostly sessile stellae with elongate midpoints 1–2 mm long and reduced lateral rays 0.05–0.3 mm long, a distinct class of smaller stellae present or lacking; major veins with both stalked and sessile

stellae, stalks to 1 mm; abaxial leaf surfaces densely tomentose with interwoven stalked and sessile stellae, usually lacking midpoints and with well-developed rays of varying length, sometimes over 1 mm long; petioles typically ¼ to ⅓ the length of the blade, inflorescence 3- to 20-flowered; the lowermost 4 to 6 flowers perfect; subsequent ones female-sterile; pseudoaxis 0.7–22 mm long; pedicels 4–12 mm long in flower; calyx broadly campanulate, green, stellate-pubescent; calyx lobes broadly ovate, acute tipped, 14–19 mm long; corolla white, 4.8–6.2 cm across, divided to near base into ovate or ovate-lanceolate lobes, externally stellate-pubescent; anthers 10–14 × 3–5 mm; style glabrous, 8–11 × 1.5–2.0 mm, berries 1 to 5 per inflorescence, globose, 4.2–7.0 cm diam., 4-locular, orange when ripe with light green to orange flesh, densely stellate-pubescent at maturity, hairs soon deciduous, pericarp stellae sessile with elongate midpoints, 0.6–1.2 mm long with 9 to 15 lateral rays near base about 0.2 mm long; seeds from ca. 60 to 150 or more, light tan, lenticular, broadly ovate, 3.0–3.8 mm long. Chromosome number, $n = 24$.

The following key should serve to distinguish the new species from the other large-fruited members of *Solanum* sect. *Lasiocarpa* cultivated in the Americas.

KEY TO LARGE-FRUITED CULTIVATED AMERICAN SPECIES OF *SOLANUM* SECT. *LASIOCARPA*

1a. Leaves and stems prickly . . . . . 1. *S. quitoense*
1b. Leaves and stems unarmed.
  2a. Berries deep red or brown to orange-red or orange, usually over 5.0 cm diam. with pubescence of very readily deciduous, soft stellate hairs with midpoints rarely longer than 1 mm; fruit flesh orange; young leaves and stems green; mostly grown below 500 m . . . . . 2. *S. sessiliflorum* var. *sessiliflorum*
  2b. Berries orange, small to large, with pubescence of deciduous, slightly harsh stellate hairs with midpoints often longer than 1 mm; fruit flesh orange to green; young leaves and stems purplish, reddish or green; mostly grown above 900 m.
    3a. Fruit flesh usually deep green; fruit diam. 4.5–5.5 cm; midpoints of stellae of most fruit hairs over 3.5 mm long; young leaves and stems with strong reddish or purplish cast; pollen 19–21 μm, over 90% of pollen taking stain; seeds several hundred, usually less than 3.0 mm long . . . . . 1. *S. quitoense*
    3b. Fruit flesh orange or light green; fruit small to large; midpoints of stellae of fruits less than 2 mm long; young leaves and stems green or slightly reddish or purplish; pollen of various sizes, frequently less than 90% stainable; seeds usually 100 or less, usually over 3.0 mm long.
      4a. Fruit flesh very light green or orange; berries small to large.
        5a. Berries naturally less than 3.8 cm diam. (nearly to 6.0 cm when sprayed with 2,4-D); pollen stainability less than 40%; pollen around 21 μm, tricolpate; seeds few or none . . . . . 3. *S. quitoense* × *S. sessiliflorum* "Puyo"
        5b. Berries 4.0 to 5.4 cm diam.; pollen stainability seldom less than 70%; pollen 26–28 μm; some grains tetracolpate; seeds 60 or more . . . . . 4. *S. indianense* (tetraploid Puyo)
      4b. Fruit flesh orange; fruits usually over 5.5 cm diam.
        6a. Seeds few or none; pollen stainability 40% or less; pollen around 21 μm, tricolpate . . . . . 3. *S. quitoense* × *S. sessiliflorum* "Palora"
        6b. Seeds 60 or more; pollen stainability usually over 70%, pollen 26–28 μm, some grains tetracolpate . . . . . 4. *S. indianense* (tetraploid Palora)

1. *Solanum quitoense.* The prickly naranjilla dominates the area of cultivation from Colombia to Guatemala. Unarmed plants are grown in Ecuador and Colombia. This species is also grown as an ornamental in the United States. In Latin America the naranjilla may escape from cultivation and establish weedy populations (Whalen et al., 1981).

Two autotetraploids of a naranjilla have been secured by colchicine treatment. The plants have produced few fruits and still fewer seeds. Three nearly sterile hybrids have been secured in a cross with *S. indianense* as the male parent.

2. *Solanum sessiliflorum.* The typical variety, usually known as cocona, is grown primarily in the eastern lowlands of the northern Andean countries extending into Brazil (Whalen et al., 1981). Unlike *S. quitoense* it is quite variable, particularly in characters of the fruit. Escapes from cultivation are not uncommon (Whalen et al., 1981).

3. *Solanum quitoense* × *S. sessiliflorum* var. *georgicum* "Puyo" and *S. quitoense* × *S. sessiliflorum* var. *sessiliflorum* "Palora." These F_1 hybrids, which are propagated by cuttings, are mostly intermediate between their parents, although some characters are slightly larger than in either of the parents because of hybrid vigor. The Puyo hybrid normally produces a rather small fruit (3.0–3.8 cm diam.), but spraying the flowers with a dilute solution of 2,4-D gives a much larger fruit. This prac-

tice has become a regular part of its culture in Ecuador.

4. *Solanum indianense.* As can be seen from the key, the two tetraploids that constitute this new species are propagated by seeds and are very similar to their diploid progenitors, which are discussed in #3 above. Their very thick stems usually readily distinguish the tetraploids from the diploids but it is difficult to give precise measurements because stem size is influenced by soil fertility. The tetraploids are more variable than their diploid progenitors in height, presence and amount of red pigment in the leaves and stems, fruit size, flesh color, fertility, and time of flowering. The great variability can probably be explained by chromosome behavior at meiosis. Thirty-five cells were examined in one of each of the two tetraploids. From 12 to 24 bivalents were found with the other chromosomes associating in up to six quadrivalents (rarely as trivalents and univalents). If regular pairing (24 pairs) occurred with normal segregation of the chromosomes, little or no variation would be expected (Stebbins, 1971). Other causes of variation are also now known in neopolyploids (Schranz & Osborn, 2004).

It is too early to propose cultivar names for the new species. Both of the tetraploids, as well as hybrids between them, are now being grown in Ecuador. From these plants, selections will be made with more desirable combinations of characters that will become more widely grown and deserving of names. With selection we can also anticipate better chromosome pairing and an increase in fertility (Ramsey & Schemske, 2002).

Discussion

Nearly a hundred years ago when it was discovered that colchicine could induce polyploidy, there was great hope that newly created polyploids would add greatly to our cultivated crops. Only a few have proven successful and these usually only after many years of work (Simmonds & Smartt, 1999). There is some reason to believe that *Solanum indianense* may be successful, for it should be able to outperform its chief competition, the diploid hybrids, neither of which can be readily improved as they rarely reproduce sexually. In addition to becoming established as cultivated plants, it is possible that plants of *S. indianense* will become weedy escapes.

Acknowledgments. We thank Marti Crouch, Ellen Dean, Gerald Gastony, Loren Rieseberg, and Tyson Roberts.

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New Combinations and a New Species in *Morella* (Myricaceae)

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Abstract. The molecular support for current generic concepts in Myricaceae has made it necessary to make new combinations in *Morella*. *Morella* comprises approximately 47 species found in the Old and New World tropics. Three new combinations are made here: *Morella adenophora*, *M. nana*, and *M. punctata*. *Morella nana* is lectotypified, and a new species, *M. rivas-martinezii*, is described.

Key words: Canary Islands, China, Cuba, *Morella*, *Myrica*, Myricaceae, Taiwan.

With the exception of the monotypic genera *Comptonia* L'Héritier ex Aiton (northeastern U.S.A.) and *Canacomyrica* Guillaumin (New Caledonia), the species of Myricaceae have traditionally been referred to the Linnaean genus *Myrica* (Cronquist, 1981; Kubitzki, 1993; Zomlefer, 1994; Takhtajan, 1997). There are, however, significant differences between the two deciduous species with dry fruits of the temperate Northern Hemisphere (*Myrica gale* L. and *M. hartwegii* S. Watson) and the remaining ca. 47 evergreen species with papillose, fleshy fruits that are disjunctly distributed in the Old and New World tropics. Some authors have recognized these two groups at the subgeneric level (Engler, 1888; Melchior, 1964; Elias, 1971), while others have given them generic status (Spach, 1841; Chevalier, 1901; Baird, 1969, unpublished thesis, University of North Carolina, Chapel Hill; Wilbur, 1994; Judd et al., 1999; Polhill & Verdcourt, 2000). Previous authors have used both *Myrica* L. and *Morella* Loureiro to refer to the evergreen species, and a long history of nomenclatural difficulties is associated with the typification of these two genera.

In the only monograph of the family, Chevalier (1901) placed the dry-fruited species in the genus *Gale* Duhamel. It can be assumed that he considered one of the fleshy-fruited species to typify the genus *Myrica*, in which he placed the majority of species. However, he did not cite types for these genera. Subsequent authors (e.g., Baird, 1969, unpublished; Wilbur, 1994) have retained *Myrica* for the dry-fruited species, adopting *Morella* for the remaining taxa.

Recently, Verdcourt and Polhill (1997) made a proposal to conserve the name *Myrica* with the conserved type of *M. cerifera* L. (one of the fleshy-fruited species) in an attempt to minimize the number of necessary name changes. However, the Committee for Spermatophyta (Brummitt, 1999) rejected the proposal. Thus *Myrica gale* is the lectotype of *Myrica* (Herb. Linn. No. 373 [Inst. France]; lectotype designated by Jonsell & Jarvis (in Jarvis et al., 1993)), and the majority of species previously known as *Myrica* must be transferred to *Morella*. The following key separates the two genera:

Key to Differentiate *Myrica* and *Morella*

1a. Shrubs deciduous; leaves with sunken stomata; inflorescences borne on the previous year's growth; fruits dry with adherent spongiose bracteoles, water-dispersed . . . . . *Myrica*

1b. Shrubs or trees evergreen; leaves with stomata not sunken; inflorescences borne on the present year's growth; fruits papillose, fleshy, sometimes with a waxy covering, bird-dispersed . . . . *Morella*

New combinations in *Morella* have been made for species in North America (Wilbur, 1994), Africa (Killick et al., 1999), Malesia (Turner, 2001), South America (Parra-O., 2002), and some in Central America and the Caribbean (Wilbur, 2001; Knapp, 2002). In the course of the preparation of a Ph.D. thesis on Myricaceae, in which new molecular data support the recognition of *Morella* (Herbert, 2005), it became apparent that some new combinations in *Morella* were necessary. A new species is described and three new combinations are made here to provide valid names for species recognized in a forthcoming molecular phylogenetic paper.

Morella adenophora (Hance) J. Herbert, comb. nov. Basionym: *Myrica adenophora* Hance, J. Bot. 21: 357. 1883. TYPE: [China.] "In dicione Ting-on ins. Hai-nan, m. Nov. 1882," *B. C. Henry 22159* (holotype, BM).

This species occurs in Hainan, Guangdong, and Guangxi in China (Lu & Bornstein, 1999); variety *kusanoi* Hayata is recognized in the *Flora of Taiwan* (Yang & Lu, 1996). *Morella adenophora* is a shrub (up to 3 m in height) and is closely related

to *Morella nana*, which occurs in the neighboring provinces of Yunnan and Guizhou (see below). *Morella adenophora* is also closely related to *Morella rubra* Loureiro, which is widely cultivated in China and also occurs in Japan. The fruits of *M. rubra* (up to 3 cm diam.) are significantly larger than those of *M. adenophora* (up to 1 cm diam.). All three species share the character of a single fruit developing at the apex of the infructescence, thus differing from the other Asian species, such as *M. javanica* (Blume) I. M. Turner, in which more than one fruit per infructescence develops.

Morella nana (A. Chevalier) J. Herbert, comb. nov. Basionym: *Myrica nana* A. Chevalier, Mém. Soc. Sci. Nat. Cherbourg 32: 202. 1901. TYPE: China. Yunnan Province: Bois de Mao-Kou-Tchang, au dessus du Tapintz, *P. J. M. Delavay 148* (lectotype, designated here, P).

This species is found in central and northern Yunnan and western Guizhou in China. At up to 3 m in height, it is much smaller than the more widespread *M. rubra* (up to 15 m). When Chevalier (1901) described this species he had not seen specimens of *M. adenophora*; the ranges of the two species are contiguous, but detailed population-level studies of morphology and/or genetics would be required to confirm their status. *Morella nana* is recognized in the *Flora of China* (Lu & Bornstein, 1999).

Morella punctata (Grisebach) J. Herbert, comb. nov. Basionym: *Myrica punctata* Grisebach, Mem. Acad. Amer. Sci. Art N. S. 8 [Plantae Wrightianae, pt. I]: 177. 1860. TYPE: [Cuba.] "In saxosis prope Monte Verde, Feb," *C. Wright 1460* (holotype, GH).

This species is endemic to Cuba. It has entire oblong-oblanceolate leaves (3–5 cm long) and ovoid fruits (Leon & Alain, 1951), distinguishing it from the widespread *Morella cerifera* (L.) Small, which is found throughout the Caribbean (also in the United States and Central America) and which has longer leaves (to 8 cm) and globose fruits.

Morella rivas-martinezii A. Santos & J. Herbert, sp. nov. TYPE: Spain. Canary Islands: Isla de Hierro, La Dehesa, 22 Feb. 1976, *A. Santos 24699* (holotype, ORT).

A. Santos (1980) intended to publish "*Myrica rivas-martinez*" as a new species. Because different gatherings were cited as "Holotypi atque isotypi" (holotypes and isotypes), the name was not validly published (Greuter et al., 2000: Art. 37.1 & 37.2, with Art. 8.1 & 8.2). Dr. Santos has accepted my invitation to publish the taxon here as a new species of *Morella* (on the basis of his 1980 description), and this we do above.

This species is sympatric with *Morella faya* (Aiton) Wilbur in the laurel forests of La Gomera, El Hierro, and La Palma in the Canary Islands. The mature leaves, which are small (up to 20 mm) and spathulate, are distinct from the much larger and oblanceolate leaves of *M. faya*.

Acknowledgments. I thank Sandra Knapp, Thomas Lammers, and one anonymous reviewer for comments on an earlier draft of this manuscript. Ian Hedge (E) is thanked for comments on the manuscript, John McNeill (E) is thanked for nomenclatural guidance, Peter Phillipson (MO, at P) and Arnoldo Santos (ORT) are thanked for checking types. The assistance of the following is gratefully acknowledged: the curator of the herbarium of the Natural History Museum, London (BM) for loan of material, the curator and staff of the Royal Botanic Gardens Kew (K) for use of the herbarium, and the staff at the Harvard University Herbaria (GH) and The New York Botanical Garden (NY) for supplying digital images of types. My studies on the generic concepts in Myricaceae were supported by an NERC studentship (NER/S/A/2000/03638).

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A New Combination in *Myrcia* (Myrtaceae)

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ABSTRACT. In preparation for the treatment of *Myrcia* (Myrtaceae) for *Flora Mesoamericana*, the new combination *Myrcia zetekiana* (Standley) B. Holst is required.

Key words: *Flora Mesoamericana*, *Myrcia*, Myrtaceae.

Myrcia zetekiana (Standley) B. Holst, comb. nov. Basionym: *Eugenia zetekiana* Standley, J. Wash. Acad. Sci. 15: 286. 1925. *Aulomyrcia zetekiana* (Standley) Amshoff, Ann. Missouri Bot. Gard. 45: 170. 1958. TYPE: Panama. *P. C. Standley 27503* (holotype, US).

Myrcia zetekiana is one of the most unusual species in the subtribe Myrciinae, with dense purplish indument and large flowers. Based on the shape of the embryo, Amshoff (1958) correctly recognized its placement in the Myrciinae rather than Eugeniinae, making the transfer into *Aulomyrcia*. *Aulomyrcia*, however, has been considered a synonym of *Myrcia* for more than 100 years (Kiaerskou, 1893), and so it is a bit surprising that this striking, though infrequently collected, species has not been transferred until now.

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Prockia krusei (Salicaceae), una Especie Nueva del Estado de Guerrero, México

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RESUMEN. Se describe e ilustra *Prockia krusei* (Salicaceae), una especie nueva del estado de Guerrero, México. Se discute su ubicación en los géneros *Banara, Hasseltia, Hasseltiopsis, Macrohasseltia, Neosprucea, Olmediella, Pleuranthodendron, Pineda* y *Prockia.*

ABSTRACT. *Prockia krusei* (Salicaceae), a new species from the state of Guerrero, Mexico, is described and illustrated. Its position relative to the genera *Banara, Hasseltia, Hasseltiopsis, Macrohasseltia, Neosprucea, Olmediella, Pleuranthodendron, Pineda,* and *Prockia* is discussed.

Key words: *Banara*, Guerrero, *Hasseltia, Hasseltiopsis, Macrohasseltia*, Mexico, *Neosprucea, Olmediella, Pineda, Pleuranthodendron, Prockia*, Salicaceae.

En la revisión de la colección KRUSE en el Herbario Nacional de México (MEXU), se encontró una especie nueva de Salicaceae (sensu Chase et al., 2002) y se la ubicó en el género *Prockia* P. Browne ex L. debido a que los sépalos alados en el botón floral y la inflorescencia del taxón nuevo (ver Fig. 1C y D) son indudablemente semejantes al género referido. Sin embargo, la especie nueva (*Prockia krusei*) tiene ovario unilocular con tres placentas intrusivas (ver Fig. 1G), en lugar de tener ovario con 3–6 lóculos como ocurre en *Prockia*, por lo que su ubicación está lejos de ser indisputable.

Los géneros *Banara* Aublet, *Neosprucea* Sleumer y *Olmediella* Baillon tienen ovarios uniloculares con placentas fuertemente intrusivas, como en la especie nueva, pero los dos primeros siempre poseen pétalos bien desarrollados y los sépalos en el botón floral no son alados como en el nuevo taxón, ni en *Prockia*. En el caso de *Olmediella*, la distinción es más sencilla pues sus flores apétalas son unisexuales y su fruto es capsular, mientras que *Prockia krusei* y todos los géneros mencionados hasta este momento poseen flores bisexuales y bayas.

Los géneros *Hasseltiopsis* Sleumer, *Macrohasseltia* L. O. Williams y *Pleuranthodendron* L. O. Williams presentan ovarios uniloculares con placentas muy ligeramente intrusivas, el primero tiene pétalos, flores unisexuales y bayas, mientras que el segundo y tercero tienen fruto capsular, aunque *Macrohasseltia* presenta flores unisexuales y carece de pétalos, y *Pleuranthodendron* posee pétalos. Es obvio que no es posible ubicar con certeza al taxón nuevo, por sus flores bisexuales y su baya, en ninguno de estos géneros.

Hasseltia Kunth y *Pineda* Ruiz & Pavón también pertenecen a la tribu Prockieae (sensu Chase et al., 2002) como casi todos los géneros mencionados, a excepción de *Olmediella* que está ubicada en la tribu Flacourtieae (sensu Chase et al., 2002), por ello es conveniente examinarlos. *Hasseltia* tiene ovario 2(–3)-locular, pétalos y baya, y *Pineda* presenta ovario unilocular, pétalos y cápsula, características que impiden la inserción del nuevo taxón en alguno de ellos (sobre todo en *Pineda*).

A la luz de la comparación hecha hasta el momento, la ubicación genérica tiene varias posibilidades, si se adopta una posición muy estricta sobre los límites morfológicos de los taxones, se justifica la creación de un género nuevo, ya que no puede insertarse en ninguno de los descritos hasta la fecha, pues ninguno tiene flores apétalas, ovario unilocular con placentas fuertemente intrusivas y bayas simultáneamente; sin descartar esta posibilidad, no existen en este momento suficientes estudios filogenéticos y de desarrollo floral de los géneros de la familia para optar por esa solución. Si se incluye en *Prockia* (como se hace en el presente trabajo) es necesario hacer una modificación de su circunscripción, donde se admita la posibilidad de tener ovario unilocular con placentas intrusivas y no sólo ovarios 3–6 loculares. La ausencia de pétalos en *Prockia krusei* ya está incluida en su concepción actual, pues *Prockia crucis* P. Browne ex L. presenta ocasionalmente flores apétalas. La tercera alternativa es tratar de ubicar a la especie nueva en los géneros con ovarios uniloculares con placentas fuertemente intrusivas, flores petalíferas y bayas, como ocurre en *Banara* y *Neosprucea* o en *Hasseltia* ya que comparte con estos géneros los dos

últimos caracteres, aunque posee ovario 2(–3)-locular. *Banara* y *Neosprucea* parecen ofrecer opciones muy interesantes para insertar al nuevo taxón, pues comparten el mismo tipo de placentación y de fruto, el único obstáculo aparente es que siempre presentan pétalos, sin embargo, la balanza se inclina ligeramente a favor del género *Banara*, pues tiene filamentos alargados y anteras subglobosas como la especie nueva (ver Fig. 1C y D); en cambio, *Neosprucea* presenta filamentos muy cortos y anteras lineares, pero ambos géneros carecen de sépalos alados en el botón, como ocurre en *Prockia* y *P. krusei*, por lo que no fueron las opciones elegidas. Finalmente, queda *Hasseltia*, pero puede ser fácilmente excluida por la presencia de pétalos, ovario 2(–3)-locular y porque tiene disco con glándulas, mientras que *P. krusei*, *Banara* y *Neosprucea* carecen de disco.

Prockia krusei J. Jiménez Ramírez & R. Cruz, sp. nov. TIPO: México. Guerrero: Mpio. Chilpancingo, Salto Valadez, 17°27′20″N, 99°28′10″O, 1400 m, 2 ago. 1970 (fl), *Hubert Kruse 1985* [d] (holotipo, MEXU; isotipos, FCME, MEXU, MO). Figura 1.

Differt haec species ab affinibus floribus apetalis, 94–112 staminibus, ovario uniloculari, 3 placentis lamelliformibus, bacca 9 mm longa et lata atque seminibus 3.5–4 × ca. 2.5 mm.

Árboles o arbustos hasta 4 m de alto; tallo ligeramente estriado, café claro, con abundantes lenticelas; ramas jóvenes blanco pubescentes, con abundantes lenticelas amarillentas. Hojas ovado-elípticas; estípulas lanceoladas a subuladas 2–2.5 mm, pubescentes en ambas caras, terminando en una glándula, en ocasiones otra lateral cerca de la base; pecíolo (0.5–)0.8–1.8 cm, pubescente; lámina (6–)6.5–12 × (4–)4.5–8(8.5) cm; ápice agudo; base cordada a redondeada, con 5 nervios basales, 3–4 venas laterales; margen glandular-crenado, una vena terminando en una glándula circular en el ápice de cada diente; dientes 13–29(–31), 4–7 mm de largo; haz pubescente, con apariencia rugosa debida a la venación; envés visiblemente reticulado, pubescente, tricomas rectos, pubescencia más abundante en la venación. Inflorescencias cimosas (un dicasio terminal y una flor lateral; la antesis inicia en la flor terminal y la lateral basal), terminales o axilares (aparecen como axilares cuando el fruto ha madurado, y una vez que el apical se ha renovado), (3.3–)4–4.5 cm de largo, con (1–)3–4 (–5) flores, eje de la inflorescencia 1.2–1.6 cm de largo, pubescente; pedúnculos 1–3 mm de largo. Flores amarillas-verdes-rojas, apétalas; pedicelos 1–1.6 cm de largo, ligeramente pubescentes, con una bráctea basal de 3 mm de largo, lanceolada, pubescente en ambas caras; cáliz con 3(–4) sépalos reduplicado-valvados (fuertemente alados en el botón), erectos, (8–)9–10 × 8–10 mm, ovados, pubescentes en ambas caras, connados hasta 5 mm, ligeramente lobulados en la base (en ocasiones cada lóbulo con una glándula), ápice agudo, con una glándula; estambres 94–112, 3 mm de largo, nunca exsertos; anteras oblongo-elipsoides; pistilo 7 mm de largo; ovario esférico, 4 mm diámetro, unilocular, glabro; placentación parietal, 3 placentas lameliformes; estilo 3 mm de largo, recto, glabro; estigma brevemente trilobado. Fruto una baya globosa, 9 × 9 mm, con el cáliz persistente de 1.5–1.8 × 1.2–1.8 cm (se desarrollan 3–4 frutos por inflorescencia); semillas ovoides ca. 3.5–4 × ca. 2.5 mm, (1–)4–8 fértiles y generalmente 4 abortadas.

Hábitat y distribución. Se encuentra en bosque tropical caducifolio, en altitudes de 1400–1420 m, asociada a *Casearia corymbosa* Kunth, *Nopalea* sp., *Opuntia* sp., *Agave* sp., *Ipomoea* sp., *Bursera bipinnata* (DC.) Engler, *Bursera glabrifolia* (Kunth) Engler, *Eysenhardtia* sp. y Tiliaceae, en rocas calizas. Hasta el momento sólo se ha colectado en el paraje conocido como Salto Valadez en el estado de Guerrero y la población es sumamente escasa.

Fenología. Florece de julio a agosto y fructifica en septiembre.

Epíteto específico. El nombre de la especie honra al Ing. Hubert Kruse, importante colector para el estado de Guerrero durante los años 1959 a 1968(–1973), en su colección, con cerca de 3500 ejemplares botánicos, destacan numerosas especies nuevas y endémicas para el estado de Guerrero, México.

A Continuación Se Presenta una Clave (Modificada en Parte de Sleumer, 1980) para Distinguir a la Especie Nueva del Resto de las Especies del Género *Prockia*

1a. Estípulas fuertemente inequiláteras o semicordadas o semireniformes, 5–10(–17) mm de largo.
  2a. Estípulas fuertemente inequiláteras o semireniformes; sépalos con margen entero o casi entero, 4–7 mm de largo.
    3a. Hojas hasta 2 veces más largas que anchas o menos. Se distribuye de México hasta Sudamérica . . . . . *P. crucis* P. Browne ex L.
    3b. Hojas generalmente 2.5 más largas que anchas o más. Conocida de Costa Rica . . . . . *P. costaricencis* Standley
  2b. Estípulas con base semicordada; sépalos con el margen serrado-glandular (al menos en la

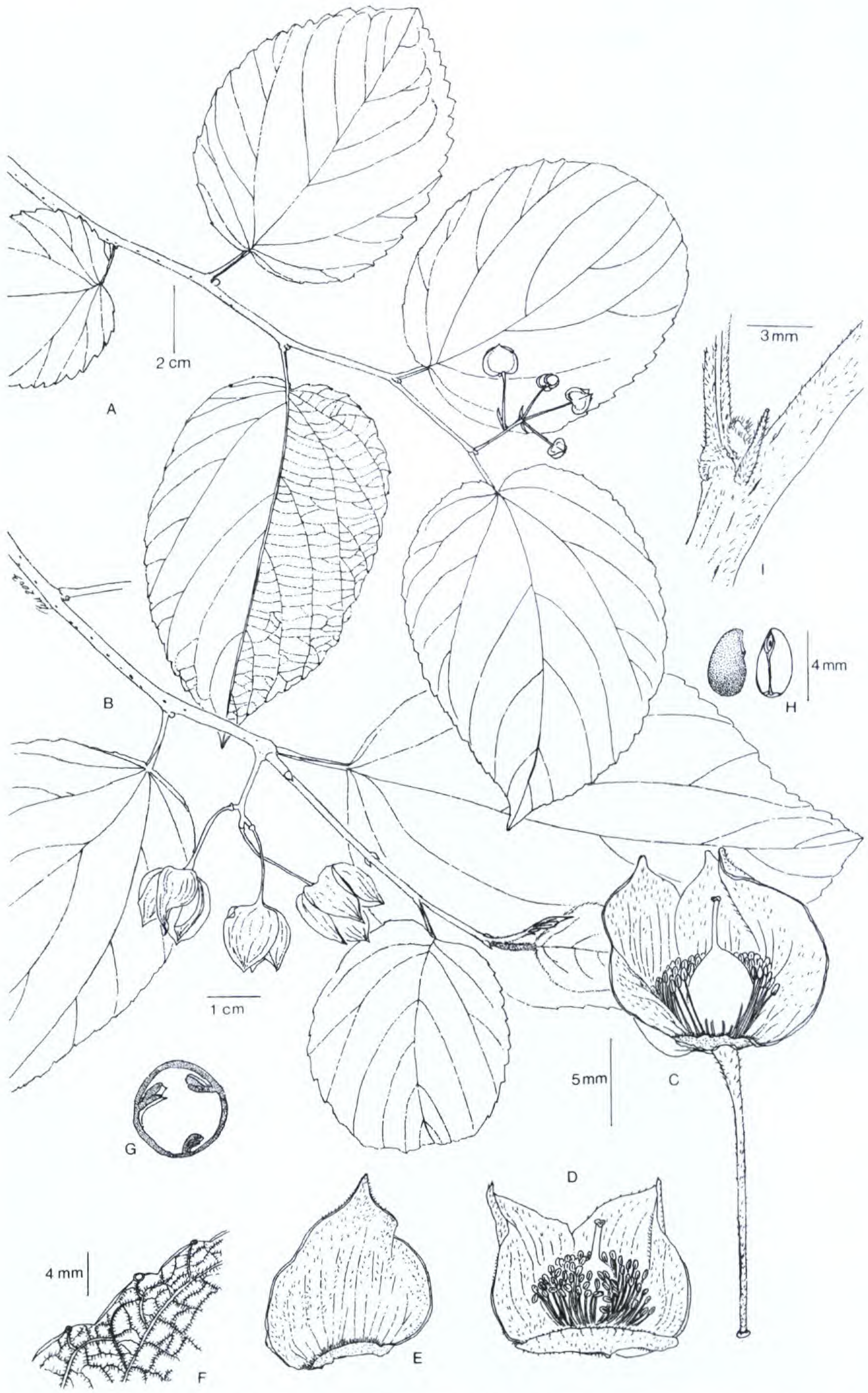

Figura 1. *Prockia krusei* J. Jiménez Ramírez & R. Cruz. —A. Rama con flores. —B. Rama con frutos. —C. Flor con cuatro sépalos, uno removido. —D. Flor con tres sépalos —E. Sépalo. —F. Margen y envés de la hoja. —G. Placentación. —H. Semillas, vista lateral y ventral. —I. Estípula. (A, C, D, E, G e I, *Kruse 1985* [d]; B, *Kruse 1985* [a]; F y H, *Kruse 1985* [c].) Ilustrado por Ramiro Cruz Durán.

base), 7–10 mm de largo. Conocida de Venezuela . . . . . *P. flava* Karsten

1b. Estípulas con la base simétrica, lineares, lanceoladas a subuladas, 1–2.5 mm de largo.

4a. Estípulas lineares, 1 mm de largo o menos; flores con 5 sépalos y 5 pétalos. Se distribuye en Ecuador y Perú . . . . . *P. pentamera* A. Gentry

4b. Estípulas lanceoladas a subuladas, 2–2.5 mm de largo; flores con 3(–4) sépalos, apétalas. Distribución restringida a Guerrero, México . . . . . *P. krusei* J. Jiménez Ramírez & R. Cruz, sp. nov.

Prockia krusei se puede diferenciar fácilmente de todas las especies del género, por tener ovario unilocular, con tres placentas intrusivas, en lugar de tener ovario trilocular y placentación axilar. A primera vista, las especies con sépalos grandes como *P. pentamera* (10 × 3–8 mm) y *P. flava* (7–10 × 5–8 mm) se parecen a la especie nueva (8–10 × 8–10 mm), sin embargo, es sencillo distinguirla de la primera porque ésta tiene 5 sépalos y 5 pétalos, mientras que *P. krusei* tiene 3–4 sépalos y carece de pétalos. La separación de la segunda se debe a que esta especie posee 50–70 estambres, baya de 4–8 mm de diámetro y semillas de 1 mm de longitud, en contraste, la especie nueva tiene 94–112 estambres, baya de 9 mm de diámetro y semillas de 3.5–4 mm de longitud.

Prockia costaricencis (una de las dos especies con sépalos de hasta 7 mm de largo) y la especie nueva pueden separarse porque *P. krusei* presenta estípulas de lanceoladas a subuladas, de 2–2.5 mm de largo y fruto de 9 mm de largo, frente a estípulas semireniformes, de 5–9 mm de largo y los frutos de 7 mm de largo de *P. costaricensis*.

Prockia crucis (la segunda especie con sépalos de 7 mm de longitud o menos) se puede distinguir de *P. krusei* por el tamaño de las estípulas (5–8 mm de largo en la primera y 2–2.5 mm de largo en la segunda especie), y por el tamaño del fruto y las semillas (baya de 6–8 mm de diámetro y semilla de 1–1.5 mm de largo en *P. crucis* y baya de 9 mm de diámetro y semilla de 3.5–4 mm de largo en *P. krusei*).

Paratipos. MÉXICO. **Guerrero:** Mpio. Chilpancingo, Salto Valadez, *Hubert Kruse 1985* [a] (FCME, MEXU), *Hubert Kruse 1985* [b] (FCME, MEXU), *Hubert Kruse 1985* [c] (FCME, MEXU), *R. Cruz Durán 5974* (FCME).

Agradecimientos. Al Dr. Mario Sousa del Herbario Nacional (MEXU) por las facilidades otorgadas para la consulta del material de la colección KRUSE, a la P. de Biól. Gloria Andrade por los datos biográficos referentes al Ing. Hubert Kruse, a la M. en C. Martha Martínez Gordillo la diagnosis en latín y la revisión crítica al manuscrito, al M. en C. Carlos Ruiz Jiménez el apoyo técnico en el manejo de la Figura 1, así como al Biól. José Antonio Hernández Gómez de Microcine, Facultad de Ciencias, UNAM, la digitalización de la misma. En particular, a la Dra. Sue Zmartzy por la cuidadosa revisión y atinadas sugerencias al manuscrito y a los revisores anónimos sus valiosas observaciones.

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A New Species of *Gymnosporia* (Celastraceae) from Southern Africa

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Abstract. *Gymnosporia gariepensis* Jordaan (Celastraceae), here described as a new species, is known only from the Gariep Center, an arid region of high floristic endemism in the northwestern corner of the Northern Cape (South Africa) and adjacent parts of southern Namibia. An illustration and a distribution map are provided. Diagnostic characters include: the robust thorns that terminate the short, abbreviated lateral branches on older shoots, and the capsules that are reddish, smooth, and obconic-trigonous. The new species is related to *G. tenuispina* (Sonder) Szyszylowicz, a species with slender thorns with which it shares arils that are reduced to a fleshy rim at the base of the seeds.

Key words: Celastraceae, Celastroideae, Gariep Center of Endemism, *Gymnosporia*, southern Africa, taxonomy.

Gymnosporia (Wight & Arnott) Hooker f., an Old World woody genus of about 108 species and subspecies in subfamily Celastroideae of the Celastraceae, has recently been reinstated (Jordaan, 1995; Jordaan & Van Wyk, 1999; Archer & Jordaan, 2000). Celastroideae are characterized by dry dehiscent capsules and arillate seeds. Included in *Gymnosporia* are all the thorn-bearing members previously classified under *Maytenus* Molina s.l. (Marais, 1960; Robson, 1965, 1966, 1994).

During a study of *Gymnosporia*, a number of undescribed species have been discovered. The purpose of this paper is to describe one of the new species; it has a restricted geographical distribution centered in the Richtersveld, an arid mountainous region in the northwestern corner of the Northern Cape, South Africa, as well as in the adjacent southernmost part of Namibia.

The new species shows affinity with *Gymnosporia tenuispina* (Sonder) Szyszylowicz, a species with slender thorns of the summer-rainfall savanna region in northeastern South Africa with which it shares arils that are reduced to a fleshy rim at the base of the seeds. A similar reduced aril is also encountered among species of *Gymnosporia* in northeastern tropical Africa, a region considered, in addition to southern Africa, as one of the centers of diversity for the genus (Sebsebe, 1985). Floristic similarities between the arid parts of southern Africa and the Horn of Africa are well established and strongly support the proposed former existence of periodic biogeographical connections between these two regions (Van Wyk & Smith, 2001).

Gymnosporia gariepensis Jordaan, sp. nov. TYPE: South Africa. Northern Cape: Richtersveld Nat. Park, Die Toon, E of Tatasberg, 1 July 1995, *J. P. Rourke 2085* (holotype, NBG; isotypes, MO, PRE). Figure 1.

Gymnosporiae tenuispinae similis, sed omnino glabro; spinis semper ramos secundarios terminantibus; ramulis juvenibus rubrobrunneis; lamina coriacea, margine semper integra; floribus fructibusque in pedicellis longis pendulis, semper in brachyblastis in ramulis lateralibus secundariis; floribus majoribus, capsulis rubris, viride suffusis, differt.

Lax, few- to multistemmed shrubs, up to 2 m high, thorny, glabrous, dioecious; *branches* terete; young branchlets smooth, purplish red to red-brown, becoming gray with small, round slits in bark, each containing a sunken lenticel, flaking in uneven white pieces; *thorns* slender and axillary on young shoots, becoming robust and terminating the abbreviated lateral branches on older shoots, up to 15 mm long. *Leaves* fasciculate in axils of brachyblasts on abbreviated lateral branches, alternate on young branchlets, coriaceous, pale green, subsessile, glabrous; lamina oblong or obovate-oblong, 12–45 × 2–5 mm, apex rounded or subemarginate,

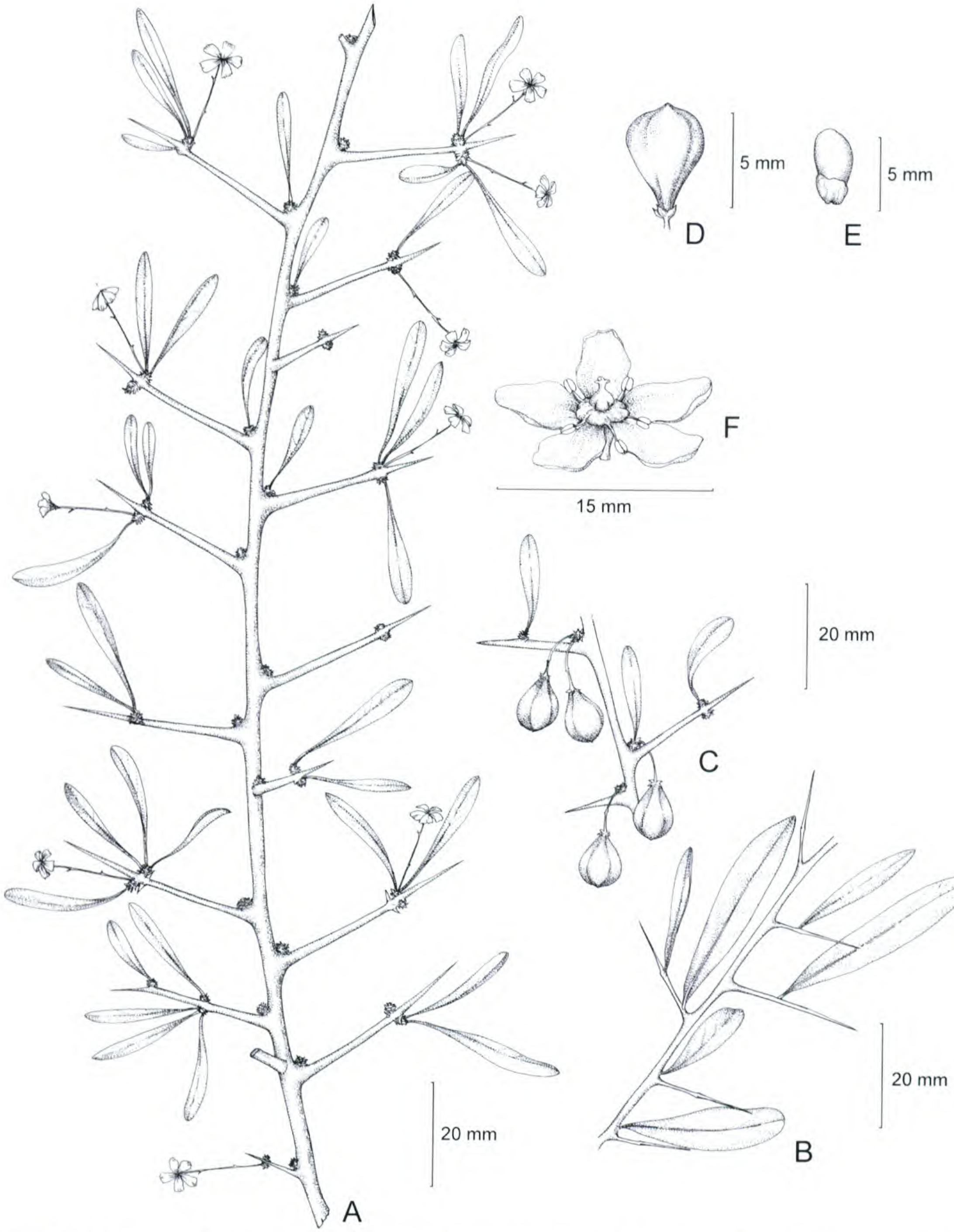

Figure 1. *Gymnosporia gariepensis* Jordaan. —A. Flowering branch. —B. Young branchlet. —C. Fruiting branch. —D. Capsule. —E. Seed with aril reduced to a rim at base. —F. Female flower. A and F drawn from the holotype, *Rourke 2085* (NBG); B from *Drijfhout 2969* (PRE); C, D, and E from *Jurgens 28856* (PRE).

base cuneate, margin entire, venation obscure (at least in dried material); petiole very short, ± 0.5 mm long; stipules very short, subulate, ± 0.5 mm long. *Inflorescence* cymose, axillary or on short abbreviated lateral branchlets; peduncle 1–5 mm long; pedicels 5–13 mm long. *Flowers* functionally unisexual, pentamerous, 7–10 mm diam.; *sepals* triangular-ovate, 1–2 mm long, apex acute, margin ciliolate; *petals* oblong, yellowish green, 2.5–4.0 mm long, margin subentire; *disc* flat, entire or shal-

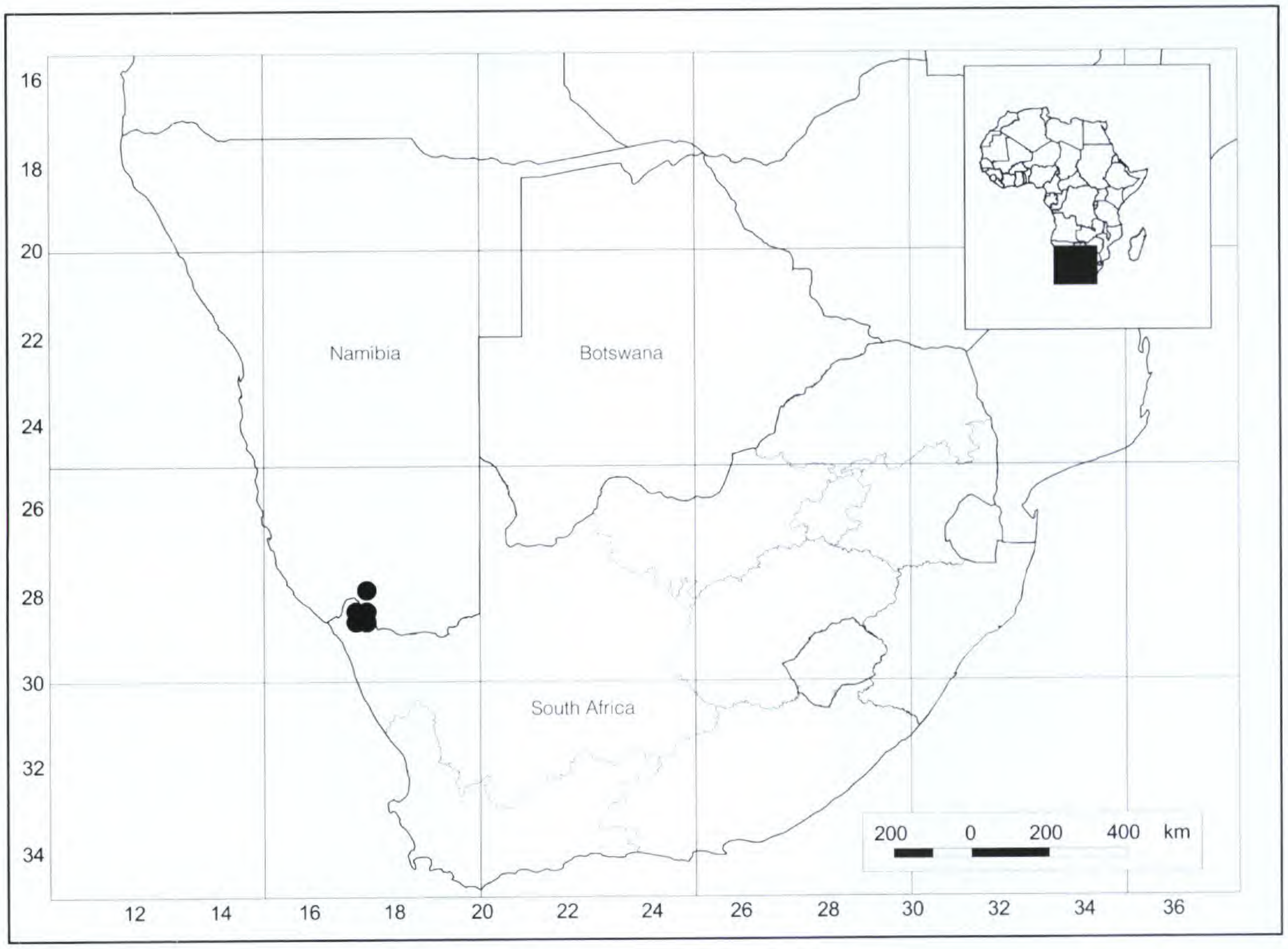

Figure 2. Known geographical distribution of *Gymnosporia gariepensis* (●).

lowly 5-lobed; *male flowers*: stamens shorter than petals; filaments ± 2 mm long, arising at lower outside edge of disc; pistillode small; style short, unbranched; *female flowers*: staminodes slightly shorter than stamens in male flowers; ovary 3-locular, subglobose; style very short, terete; stigma 3-branched. *Capsules* 3-valved, obconic-trigonous, smooth, chartaceous, pendulous, 9–12 mm long, upper part red, lower part green; *seeds* reddish brown, rugose, ± 5 mm long; aril yellow, reduced to a fleshy rim at base of seed.

This species is a laxly branched shrub with purplish red to red-brown stems, becoming gray with age. On older branches the robust thorns terminate short, abbreviated lateral branches. The leaves are coriaceous, long, and narrow, and the venation is obscure. Inflorescences and capsules are borne mainly on short abbreviated lateral branchlets and are rarely axillary. The inflorescences are few-flowered, or flowers are sometimes solitary. The capsules are pendulous, obconic-trigonous, red, and smooth, with the veins not visible. This new species is allied to *Gymnosporia tenuispina*, which has slender thorns, usually in the axils of the leaves or brachyblasts, and small, yellow, smooth, somewhat inflated and obconic-trigonous capsules. In *G. tenuispina*, the leaves are chartaceous, the venation is visible, and the margins are shallowly glandular denticulate to subentire, whereas in *G. gariepensis* the leaves are leathery, the venation is inconspicuous, and the margins are entire or with only a few remnants of teeth.

Distribution and habitat. Plants usually grow among large rocks in sparse, semidesert vegetation in the extremely arid northern Richtersveld and adjacent southernmost part of Namibia, where it is currently known from only a few populations (Fig. 2). The geographical distribution of *Gymnosporia gariepensis* and its closest ally is markedly disjunct. *Gymnosporia tenuispina* occurs in eastern Botswana, southern Zimbabwe, and in South Africa in the Limpopo Province, North-West, Gauteng, Mpumalanga, the northern Free State, and northern KwaZulu-Natal.

Etymology. The specific epithet refers to the Orange River, which cuts through the distribution area of the species—*Gariep* is the Khoekhoe name of the Orange River and means "Great River." Known as the Gariep Center of Endemism, this region along the lower reaches of the Orange River

is well known for its high levels of floristic endemism and forms part of the larger Succulent Karoo Region (Van Wyk & Smith, 2001). Within the range of the new species the mainly winter rainfall is usually less than 50 mm per annum, and extremely hot temperatures (> 40°C) are frequently experienced in summer (Hilton-Taylor, 1996; Van Wyk & Smith, 2001).

Conservation status. As most individuals of *Gymnosporia gariepensis* are known from the Richtersveld National Park, the species enjoys at least some protection. Unfortunately, domestic livestock is allowed inside the park and the resultant overgrazing by goats and sheep is causing serious damage to the vegetation.

Paratypes. NAMIBIA. Mara, *Craven 2644* (WIND); Knersberg, 4 km NW of Sambokrivier, 29 Apr. 1988, *Van Jaarsveld & Leitch 9736* (NBG, PRE). SOUTH AFRICA. **Northern Cape:** Gannakouriep, *Hardy 2602* (PRE); Richtersveld, Die Toon, E of Tatasberg, 17 Sep. 1989, *Jurgens 28856* (PRE), Feb. 1995, *G. & F. Williamson 5576* (NBG); Richtersveld, S slopes of Rosyntjieberge, 11 June 1980, *Drijfhout 2969* (NBG, PRE).

Acknowledgments. We are most grateful to the curators of NBG and WIND for the loan of specimens; John Rourke for collecting the type material; Marietjie Steyn for doing the line drawings; Hugh Glen for providing the Latin diagnosis; Emsie du Plessis for critically reading and improving the manuscript; and Hester Steyn for preparing the map.

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Dupuya, a New Genus of Malagasy Legumes (Fabaceae)

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Abstract. The new endemic Malagasy genus *Dupuya* is proposed based on morphological characters. It has two species, *D. haraka*, comb. nov., and *D. madagascariensis*, comb. nov., and is distinguished from related genera in having no petals, numerous stamens, a whorl of staminodes inside the stamens, and a number of distinctive seed characters. A new combination is also made for *Dupuya madagascariensis* subsp. *tamarindoides*. *Dupuya* is a member of the aldinoid clade with the genera *Aldina*, *Amburana*, *Cordyla*, *Dussia*, *Mildbraediodendron*, and *Myrospermum*.

Key words: aldinoid clade, *Cordyla*, *Dupuya*, *Dupuya haraka*, *Dupuya madagascariensis*, Fabaceae, Leguminosae, Madagascar.

In 2002, the outstanding *Leguminosae of Madagascar* was published (Du Puy et al., 2002). This comprehensive treatment fills a critical lacuna in our knowledge of the world's legumes; 34% of the 100 native Malagasy genera and 80% of the 573 native species are endemic. All taxa were described in detail, and the fruit and seed descriptions are some of the most complete descriptions found in any floristic work. I compared all their descriptions to those in our database of legume genera (Kirkbride et al., 2003). For all the Malagasy genera, only minor revisions were needed to encompass the variations found in Madagascar, with one notable exception, *Cordyla* Loureiro, for which our seed data were completely at odds with Du Puy and Labat's (2002) descriptions and illustrations of the genus and its two constituent species in Madagascar. Du Puy and Labat (2002: 294) had noted, "the Malagasy species are distinctive as the inner stamens are sterile." Examination of the USDA, ARS, U.S. National Seed Herbarium (BARC) material revealed that our seed data were based only on African specimens of *Cordyla*, and corresponded with that of Corner (1976) for *C. africana* Loureiro. After examining specimens of all five African *Cordyla* species (see Appendix 1), as well as the two in Madagascar, it was apparent that Du Puy and Labat (2002) had correctly described the latter and that our data for the African members were also correct. Based on the presence of staminodes in the Malagasy species and their absence in the African species, along with the many differences in the seeds of the two groups (see the key to genera below), the two Malagasy species are here described as *Dupuya* J. H. Kirkbride, a new genus endemic to Madagascar.

Systematic History of *Cordyla* s.l.

Loureiro (1790) described the genus *Cordyla* with a single species, *C. africana*. Milne-Redhead (1937) speculated that Loureiro collected the type specimen in Mozambique because the common name that he used for it, "mutonda," was still in use for it there. Milne-Redhead (1937) revised the four African species known to him, and later Gillett (1960) added a fifth, *C. somalensis* J. B. Gillett. Viguier (1948) described the first Malagasy species, *C. madagascariensis* R. Viguier, and Capuron (1968) published the second, *C. haraka* Capuron, in his revision of Malagasy *Cordyla*. Following Capuron, all other *Cordyla* treatments have been floristic in nature (Aubréville, 1970; Berhaut, 1975; Brenan, 1967; Brunel et al., 1984; Cowan, 1981; Du Puy & Labat, 2002; Gilbert & Boutique, 1952; Gillett, 1960, 1962; Hedburg & Edwards, 1989; Hutchinson, 1964; Keay, 1958, 1989; Keay et al., 1964; Lebrun & Stork, 1992; Ross, 1977; Thulin, 1993) without attempting to compare or re-evaluate its generic delimitation based on an analysis of all its members.

Herendeen (1995) carried out extensive phylogenetic analyses of the 11 genera in tribe Swartzieae sensu Cowan (1981). He used 29 morphological characters, including 3 from seeds and 1 from the fruit. In addition, 19 Sophoreae and 3 Caesalpinieae genera were scored. The Sophoreae genera were included because Herendeen (1995: 123) considered them to be "the likely sister group to Swartzieae" and some genera, such as *Ateleia* (DC.) Bentham, *Cyathostegia* (Bentham) Schery, and *Holocalyx* Micheli, were difficult to place in the correct tribe. The Caesalpinieae genera served as outgroups. The Swartzieae genera fell into three distinct clades in association with various genera of Sophoreae and *Orphanodendron* Barneby & J. W.

Grimes. Swartzieae is obviously a polyphyletic group, and Herendeen (1995: 130) proposed that "the concept of Swartzieae . . . should be abandoned and all members of Swartzieae should be referred to Sophoreae."

In Herendeen's analyses, *Cordyla* formed a clade with *Mildbraediodendron* Harms, well supported by three nonhomoplasious forward changes: absence of a corolla, stamens united basally, and fruit globose to elongate with a fleshy endocarp and two homoplasious forward changes: punctate leaflets and abaxial stomata with a variable number of subsidiary cells, more than two. Our seed observations (Kirkbride et al., 2003) strongly support this relationship (Figs. 1–3). *Cordyla* and *Mildbraediodendron* seeds are large, lack a testa, have straight embryos paralleling the seed length, the radicle tip straight, and the plumule well developed, and are centered relative to the cotyledons.

Pennington et al. (2001) studied the evolution of the basal faboid legumes to clarify the broad-scale relationships within subfamily Faboideae. They carried out phylogenetic analyses using *trn*L intron sequences for 122 taxa, representing 14 of 15 Swartzieae sensu Polhill (1994a, 1994b), 26 of 41 Sophoreae, the 20 Dipterygeae and Dalbergieae, and various placeholders for derived groups; 4 Caesalpinioideae genera were used as outgroups. Using both the *trn*L intron and spacer, Ireland et al. (2000) conducted a phylogenetic analysis focusing on tribe Swartzieae. They sequenced 14 of 15 Swartzieae genera, the genus *Bobgunnia* J. H. Kirkbride & Wiersema, 19 Sophoreae genera, and 20 Dipterygeae and Dalbergieae, using 3 Caesalpinioideae genera as outgroups. Neither study included the Swartzieae genus *Candolleodendron* R. S. Cowan. Both studies used sequences from *Cordyla madagascariensis*, which is here treated as *Dupuya madagascariensis* (R. Viguier) J. H. Kirkbride, and no African *Cordyla* s. str. was included in either study. Their results were similar, differing mainly in scope. Both Swartzieae and Sophoreae are polyphyletic groups whose genera belong in various other tribes. The sister group to the remainder of the faboid legumes is the swartzioid clade (Pennington et al., 2001), consisting of *Bobgunnia*, *Swartzia* Schreber, *Bocoa* Aublet, *Cyathostegia*, and *Ateleia*, which might be recognized as either a redefined tribe Swartzieae or a fourth legume subfamily. Also in both studies, the aldinoid clade (Pennington et al., 2001) consisted of the genera *Myrospermum* Jacquin, *Dussia* Krug & Urban ex Taubert, *Amburana* Schwacke & Taubert, *Mildbraediodendron*, *Dupuya*, and *Aldina* Endlicher. Neither of these two clades had been previously recognized in any other study.

The swartzioid and aldinoid clades (except *Aldina*) share absence of the 50-kilobase inversion in the chloroplast genome (Doyle et al., 1996; Ireland et al., 2000), which is also absent from subfamilies Mimosoideae and Caesalpinioideae and present in most of subfamily Faboideae. Because *Aldina* has the CP inversion and the remainder of the aldinoid genera do not, its relationships should be re-examined (Ireland et al., 2000), and more species belonging to the aldinoid clade should be screened for the CP inversion confirming its presence in other genera of this clade, clarifying the circumscription of the clade, and validating the membership of *Dupuya* in it.

Aside from the presence of staminodes and the differences in seed characteristics, *Cordyla* and *Dupuya* are so similar morphologically that they probably are sister genera (sensu Wiley, 1981), and therefore *Cordyla* s. str. also is probably a member of the aldinoid clade. The morphological differences separating genera of the aldinoid clade are presented in the following key.

Key to Genera of the Aldinoid Clade

1. Flowers with 1 or (3 to)4 to 7 petals; fruits dehiscent or indehiscent (*Myrospermum*); Neotropics 2
1′. Flowers without petals; fruits indehiscent; tropical Africa and Madagascar 5
2(1). Flowers with (3 to)4 to 7 petals; cotyledons with surface grooved, ridged, or rugose, unlobed; embryonic axis oblique or perpendicular to seed length 3
2′. Flowers with 1 petal (the standard); cotyledons with surface smooth, lobed; embryonic axis parallel to seed length; southeastern Peru to northeastern Brazil and south to northern Argentina . . . . . *Amburana*
3(2). Leaflets pellucid-glandular; fruit winged, indehiscent; epicarp veined; seed 10–17 × 4–7.2 × 4.5–5.5 mm; Mexico, Central America, and northern South America . . . . . *Myrospermum*
3′. Leaflets not glandular; fruit not winged, dehiscent; epicarp not veined; seed 20–60 × 10–50 × 10–40 mm 4
4(3). Corolla papilionaceous; fruit elliptic or fusiform, stipitate, with values enrolling; seed 20–45 × 10–20 × 10–20 mm, not overgrown; testa present; radicle bulbose, straight at tip; Antilles, Mexico, Central America, northwestern South America, and the western Amazon basin . . . . . *Dussia*
4′. Corolla not papilionaceous, with petals ± equal; fruit obovate, not stipitate, with values revolute; seed 35–60 × 30–50 × 22–40 mm, overgrown (1 seed completely filling the fruit cavity); testa absent; radicle triangular, curved at tip; Venezuela and the upper Amazon basin . . . . . *Aldina*

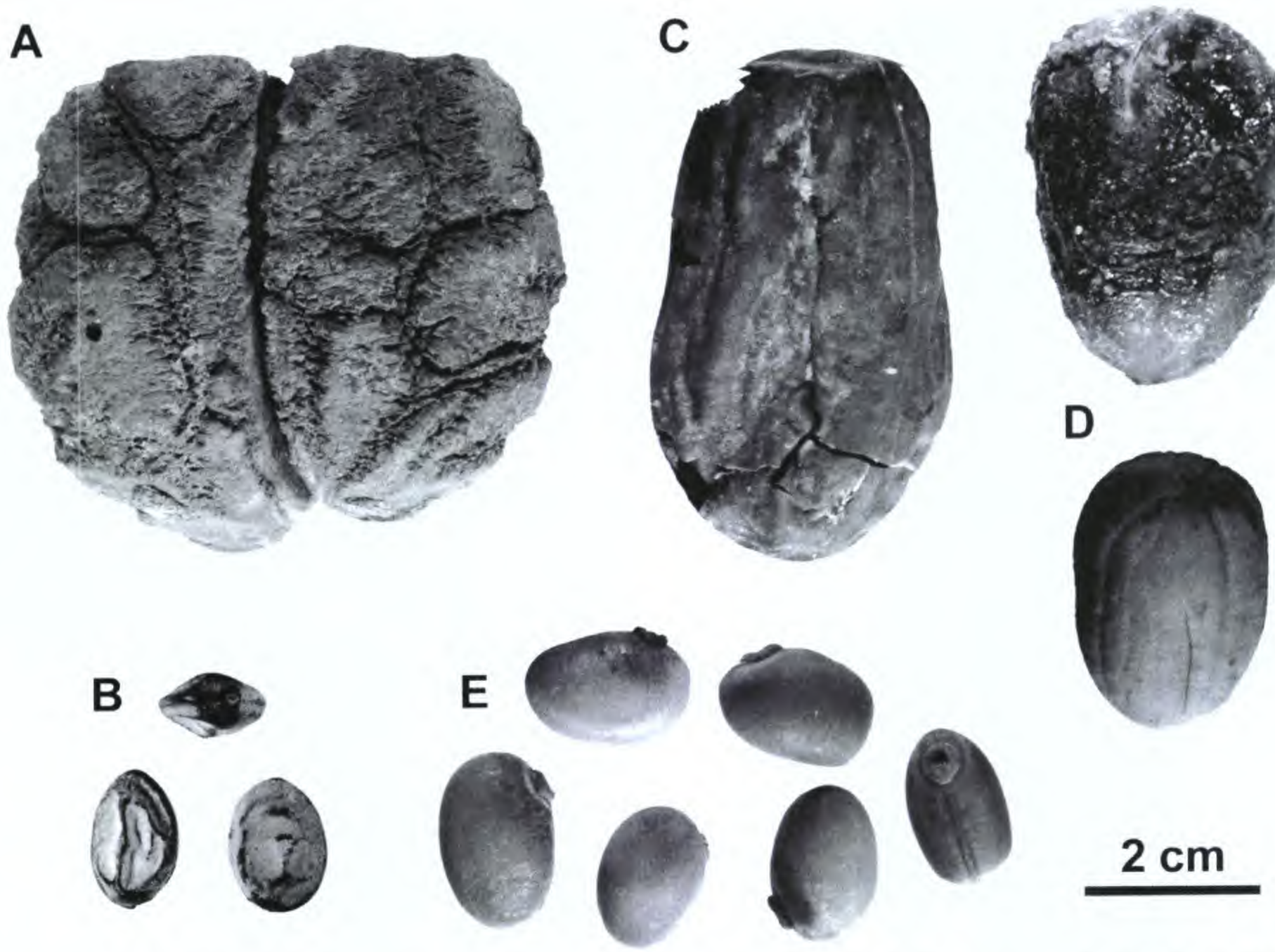

Figure 1. Seeds of *Aldina*, *Amburana*, *Mildbraediodendron*, *Cordyla*, and *Dupuya*. —A. Seed of *Aldina latifolia* Bentham (*Ducke 24049*, BARC). —B. Seeds of *Amburana cearensis* (Allemão) A. C. Smith (*PI 109210*, BARC). —C. Seed with endocarp of *M. excelsum* Harms (BARC). —D. Seeds with and without endocarp of *C. africana* Loureiro (List #95, Shipment #41, BARC). —E. Seeds with testa of *D. madagascariensis* R. Viguier subsp. *madagascariensis* (*Du Puy, Comtet & Labat 2463*, P).

5(1). Flower buds subglobose, calyx splitting into (2 to)3 unequal lobes down as far as the disc; stamens 12 to 18, basally united into a single whorl at the edge of the disc; tropical Africa . . . . . *Mildbraediodendron*

5′. Flower buds turbinate, calyx splitting into 2 to 4 unequal to subequal lobes down as far as the apex of the hypanthium; stamens numerous (20 to 130), basally united into approximately 3 or 4 whorls at apex of hypanthium 6

6(5). Staminodes in a single whorl inside stamens, ⅙ to ¼ as long as stamens; testa present, endosperm present, cotyledons folded, partially concealing radicle, one inner cotyledon face with a central ridge and the other with a central groove, embryonic axis oblique to the seed and cotyledon lengths, radicle bulbose; Madagascar . . . . . *Dupuya*

6′. Staminodes absent; testa absent, endosperm absent, cotyledons not folded, fully concealing the radicle, inner cotyledon faces flat, embryonic axis parallel to the seed and cotyledon lengths, radicle triangular; tropical Africa . . . . . *Cordyla*

Dupuya J. H. Kirkbride, gen. nov. TYPE: *Dupuya madagascariensis* (R. Viguier) J. H. Kirkbride. Figures 1E, 2E, and 3E.

A *Cordyla* et *Mildbraediodendro* staminibus multis, staminodiorum verticillo intra stamina, staminodiis staminibus circa quater brevioribus, seminibus brevioribus, arillo, testa, endospermioque praesentibus, cotyledonibus ambabus plicatis, cotyledonis unius superficie interiore crista et cotyledonis alterius superficie interiore sulco, embryonis axe obliquo ad seminis et cotyledonum axem, radicula bulbosa et aliquantum occulta cotyledonibus differt.

Trees, 5–35 m tall, deciduous, the branches with large, corky, cream-colored lenticels, bilobed with the lobes elliptic, parallel to the axis of the branch, with a sulcus between them; stipules small, caducous. Leaves alternate, imparipinnate, with alternate or subopposite leaflets, without stipels, the rachis with 2 narrow adaxial ridges, the closest one of the pair interrupted at each leaflet insertion and the other entire, sometimes extended into stipel-like points, the leaflets emarginate, with glandular streaks oblique to the midrib, sometimes just glandular dots, smaller at the base of the leaf and becoming gradually larger toward the apex of the leaf, "light green above and beneath (drying much darker above)" (Du Puy & Labat, 2002: 294). Inflorescences terminal or rarely axillary, racemose, sometimes flowers solitary in the upper leaf axils, with a caducous bract subtending each pedicel and a pair of bracteoles (sometimes caducous) on the pedicel at ca. the middle or above it. Flowers with a conspicuous hypanthium, the calyx entire, with a tuft of hairs at the apex, splitting into 2 to 4 unequal to subequal lobes, apetalous, the stamens nu-

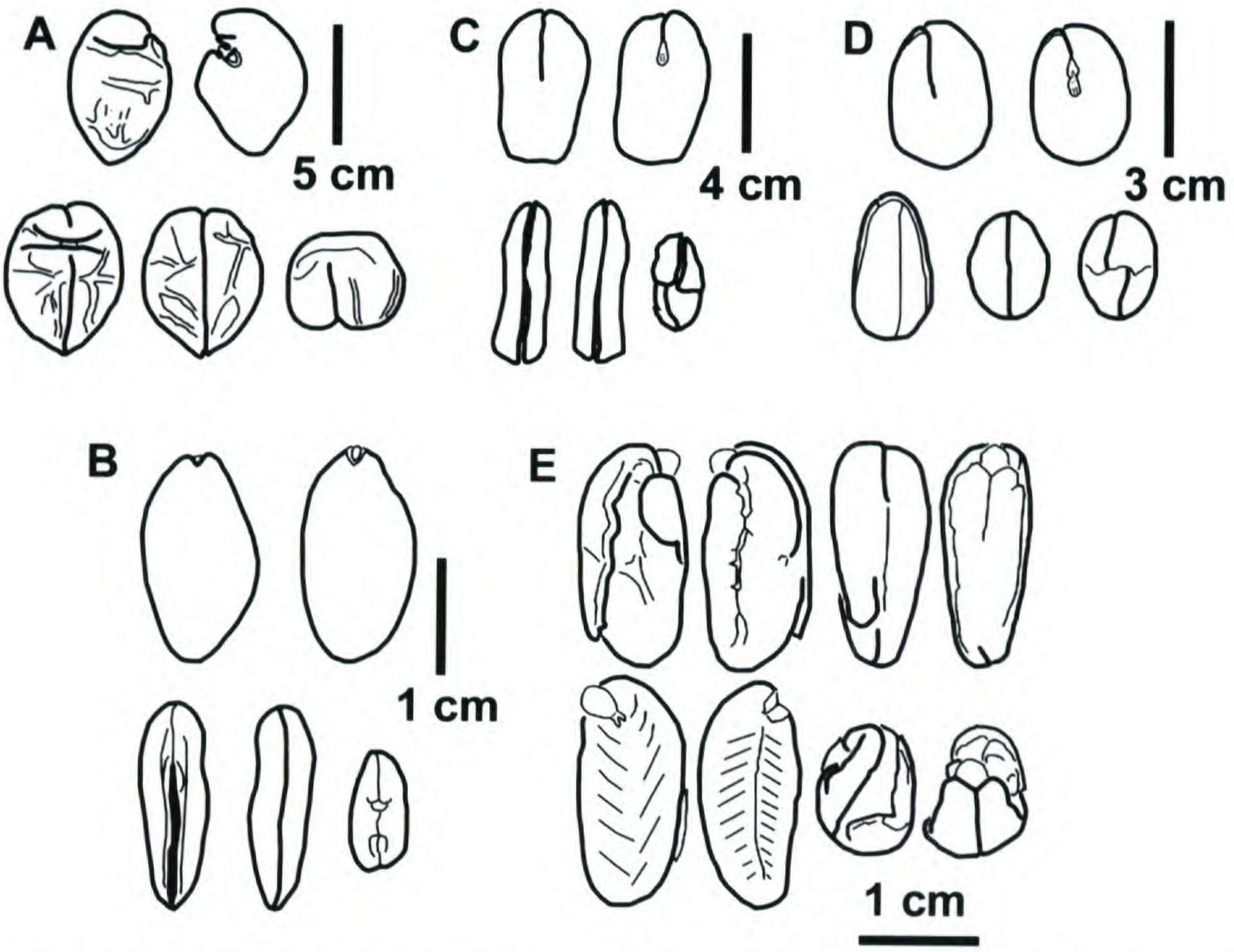

Figure 2. Embryos and cotyledons of *Aldina*, *Amburana*, *Mildbraediodendron*, *Cordyla*, and *Dupuya*. —A. *Aldina latifolia* (*Cid Ferreira et al. 7118*, BARC). —B. *Amburana cearensis* (*Glaziou 20882*, BARC). —C. *M. excelsum* (BARC). —D. *C. africana* (List #95, Shipment #41, BARC). —E. *D. madagascariensis* subsp. *madagascariensis* (*R. Capuron s.n.*, BARC).

merous, approximately arranged in three concentric whorls at the hypanthium apex, with a fourth, inner whorl of staminodes, the filaments basally connate, the anthers elliptic, dorsifixed, longitudinally dehiscent, the staminodes filament-like, 1/6 to 1/4 as long as the stamens, basally adnate to the stamens, the ovary stipitate, multiovulate, glabrous, exserted above the anthers. Fruits unilocular, straight, elliptic to oblong, terete, with or without a straight beak (5–8 mm long), the same color and texture as fruit, with the apex and base tapered or rounded and aligned with longitudinal axis of fruit; drupaceous when fresh (Du Puy & Labat, 2002) or ligneous when dry, with the margin not constricted or slightly constricted along both margins (when 2 or more seeds in fruit), stipitate, indehiscent; epicarp dull or glossy, light to dark brown or reddish to purplish brown, glabrous, longitudinally ribbed with 20 to 40 ribs; mesocarp thick, 2-layered, ligneous; endocarp dull, white when fresh (Du Puy & Labat, 2002) or pale brown when dry, spongy when dry and disintegrating at the touch, with seeds 1 to 3(4) with their length parallel with fruit length; seeds not overgrown (sensu Corner, 1951), elliptic to oblong or slightly ovate, compressed, with surface smooth, with a dry rim-aril, entire, brown; testa completely adhering to endocarp, dull, with frequent streaks, reddish to dark brown or red (Du Puy & Labat, 2002), with brown overlay, faintly grooved or striate, coriaceous; raphe from hilum through lens to base of seed and terminating, lighter than testa, reddish brown, recessed; hilum visible, with the lips of the faboid split the same color as the rest of the hilum, elliptic, recessed, within a halo lighter in color than testa; lens not discernible; endosperm thick, covering at least ½ but not the entire embryo, adnate to testa; cotyledons the same thickness and ± of equal length, with 1 to 6 longitudinal grooves on outer faces, with 1 cotyledon partially folded with flaps unequal and not touching and outer face flat, the other fully folded with flaps equal and touching and outer face concave, partially concealing radicle, notched at radicle with lobes touching (auriculate) forming a basal groin, white, inner face of fully folded cotyledon with central ridge and central groove on partially folded one; embryonic axis straight, oblique to seed length; radicle bulbose with lobe tip straight; plumule moderately developed.

The genus is named in honor of David J. Du Puy, senior author of *The Leguminosae of Madagascar*

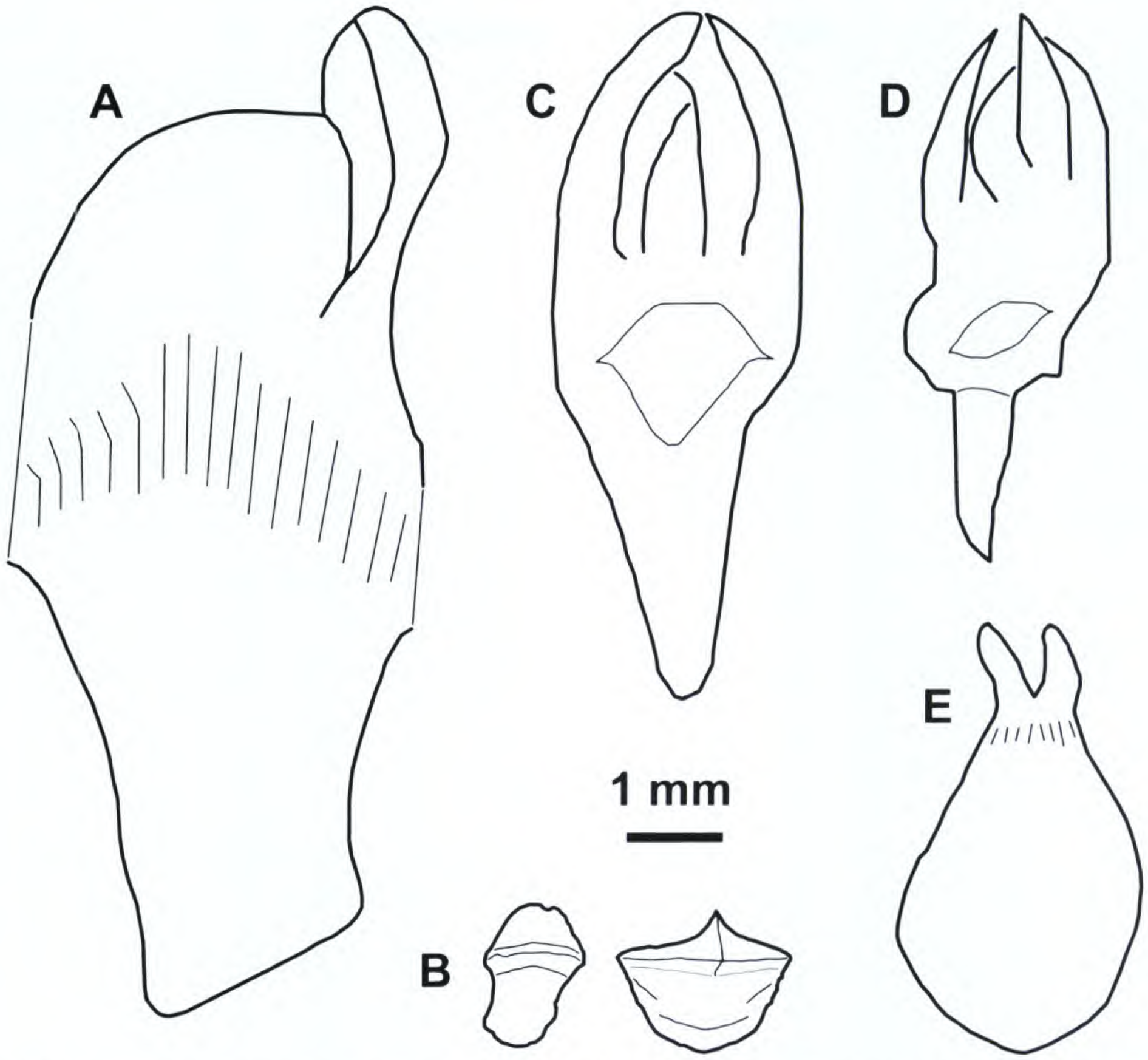

Figure 3. Embryos, with cotyledons removed, of *Aldina*, *Amburana*, *Mildbraediodendron*, *Cordyla*, and *Dupuya*. —A. *Aldina latifolia* (*Cid Ferreira et al. 7118*, BARC). —B. *Amburana cearensis* (*Glaziou 20882*, BARC). —C. *M. excelsum* (BARC). —D. *C. africana* (List #95, Shipment #41, BARC). —E. *D. madagascariensis* subsp. *madagascariensis* (*R. Capuron s.n.*, BARC).

(Du Puy et al., 2002). Du Puy and Labat's (2002) treatment of tribe Swartzieae and the genus *Cordyla* brought this new genus to my attention and supplied essential data enabling its publication.

KEY TO *DUPUYA* SPECIES IN MADAGASCAR

1. Stipules straight, obovate to narrowly so; leaves with 6 to 13 leaflets, the petiolules 1–2.5 mm long, the leaflets acute to obtuse at the base, 1–4.5 cm wide; inflorescence bracts elliptic, 2.5–3 × 1–2.7 mm; flower bracteoles elliptic to narrowly so, 3.5–6 × 1.5–2.5 mm; calyx 7–8 mm long; staminodes 3–3.5 mm long; ovary stipe 15–22 mm long; seeds 25 × 14–15 13–15 mm . . . . . *D. haraka*

1′. Stipules curved, falcate; leaves with 15 to 44 leaflets, the petiolules 0.5–1 mm long, the leaflets oblique at the base, (0.3–)0.5–1 cm wide; inflorescence bracts narrowly obovate, 1.5–2.5 × 0.5–0.7 mm; flower bracteoles narrowly obovate, 1–2 × 0.4–0.6 mm; calyx 4.5–5 mm long; staminodes 1.5–2.5 mm long; ovary stipe 9–13 mm long; seeds 15–21 × 12–13 × 9–11 mm . . . . . *D. madagascariensis*

1. **Dupuya haraka** (Capuron) J. H. Kirkbride, comb. nov. Basionym: *Cordyla haraka* Capuron, Adansonia, sér. 2, 8: 220. 1968. TYPE: E Madagascar. Massif de Farankaraina, à l'Est d'Andranofotsy (Maroantsetra), 24 Nov. 1953, *Service Forestier* (*R. Capuron*) *8658* (holotype, P not seen; isotypes, B not seen, BR not seen, G not seen, K not seen, L not seen, MO, P, WAG not seen).

A large tree 10–35 m tall, DBH 25–100 cm, the "trunk tall, often unbranched except near the crown, flaring basally into rounded buttresses, the bark deep chestnut-brown, flaking off in large irregular pieces, some areas with large corky cream lenticels" (Du Puy & Labat, 2002: 295), youngest branches strigillose with older branches gradually becoming glabrate to glabrous. Stipules straight, obovate to narrowly so, acute at the apex, 1.2–4.5 × 0.4–1.8 mm, strigillose to glabrate. Leaves 8–19 cm long, with 6 to 13 leaflets, the rachis 6–13 cm

long, strigillose to glabrate, the petiolules 1–2.5 mm long, strigillose to glabrate, with the blade obovate to rarely broadly so or elliptic to rarely broadly so, acute to obtuse at the base, emarginate to sometimes obtuse to acute at the apex, 1.3–8.5 × 1–4.5 cm, strigillose to glabrate with hairs concentrated over the midrib and veins, "becoming deep green and glossy above, pale green beneath" (Du Puy & Labat, 2002: 295), coriaceous to chartaceous. Racemes terminal or rarely axillary, (1- to)9- to 22-flowered, (3–)6–14 cm long, the bracts elliptic, obtuse to subacute at the apex, 2.5–3 × 1–2.7 mm, strigillose, the pedicels 4.5–10 mm long, strigillose to glabrate, with the bracteoles elliptic to narrowly so, acute to obtuse at the apex, 3.5–6 × 1.5–2.5 mm, glabrate to sparsely strigillose, the hypanthium expanding upward, 2.5–4 mm long, 2–3.5 mm diam. at the base and 3.2–4.5 mm diam. at the apex, strigillose to glabrate outside and glabrous inside, the calyx 7–8 mm long, glabrous to glabrate outside and sericeous inside, the filaments unequal, 11–19 mm long, glabrous, the anthers 0.7–1 mm long, glabrous, the staminodes 3–3.5 mm long, the stipe 15–22 mm long, 0.7–0.8 mm diam., glabrous, the ovary 4.5–6 × 1.5–2 mm, glabrous, the style 3–5 mm long, glabrous. Fruits ellipsoid to clavate, with a beak 2–4 mm long, 4–7 × 2–3.5 cm, glabrous, with the stipe 2–3 cm long. Seeds 25 × 14–15 × 13–15 mm.

Illustrations. Capuron (1968: fig. 5, p. 221); Du Puy & Labat (2002: fig. 55, G–J, p. 296, pl. 18, A).

Habitat and distribution. From Toamasina to Vohemar, southeast of Antsiranana, and also on the island of Nosy Bé and the Ankarana Massif in Madagascar. Found up to 700 m, in tall evergreen rainforest and also in deciduous forest in the north (Du Puy & Labat, 2002).

Common names. Haraka (*Service Forestier* (*R. Capuron*) *8658*, P); Harakafotsy (*Service Forestier 15711*, P); Vahonda (Du Puy & Labat, 2002).

Most individuals of this species are found in the eastern, evergreen, low-altitude forests, without a distinct dry season and very high annual rainfall, from Toamasina to Vohemar. At the northern end of its range, the species stretches across Madagascar at approximately 13°S latitude into the evergreen, Sambirano, low-altitude forests, with a distinct dry season of 4 to 6 months and high annual rainfall, from the vicinity of Vohemar to the island of Nosy Bé. The morphology of specimens from the eastern forests differs slightly from those collected in the Sambirano forests. The eastern-forest specimens have, in general, slightly larger structures, for example, stems bigger in diameter, larger leaflets and flowers, longer inflorescences, as well as more coriaceous leaflets than the Sambirano-forest specimens. The Sambirano-forest specimens are intermediate in some characteristics between the eastern-forest specimens and *D. madagascariensis*.

Specimens examined. MADAGASCAR. E Madagascar, Masoala Peninsula, western side, NE of Antalavia, 4 hours on foot along Antalavia River (ca. 4–5 km ?), 15°46′S, 50°2′E, 285 m, 16 Nov. 1989, *D. J. Du Puy, B. P. Du Puy, G. Rafamantanantsoa & G. Schatz M375* (P); Toamasina, Diego Suarez region, SE of town and SE of Ambilobe, near Daraina on road to Vohemar (Iharana), D. Meyer's lemur study site, 14°70′S, 49°46′E, 200 m, *G. McPherson 14735* (K, MO); District Fénérive, dans le forêt de Bemahogo, 2 km 500 à l'est du village de Andapibe et d'Ambodranpana, 30 Mar. 1952, *Rakotoniaina 8* (MO); Toamasina, Masoala Peninsula, just E of Ambanizana in hills above village, 15°38′S, 49°58′E, 10–200 m, 24 Nov. 1989, *G. E. Schatz & P. P. Lowry II 2836* (MO); Farankaraina, à l'est d'Andranofotsy (Maroantsetra), 24 Nov. 1953, *Service Forestier* (*R. Capuron*) *8658* (P); forêt orientale, forêt d'Antandrokaolo, entre Morafeno, sur la Rantabe et Amboditavolo, basin de la Fananehana, 400 m, Feb. 1954, *Service Forestier* (*R. Capuron*) *9029* (K, P); Ouest (Nord), Plateau de l'Ankarana entre les P.K.84-85 (entre Anivorano-Nord et Ambondromifehy), 14 Nov. 1958, *Service Forestier* (*R. Capuron*) *20004* (MO, P); Ouest (Nord), vestige de forêt entre Belinta et Ambetratra, à quelques kilometers au NW de Vohémer, 14 Oct. 1966, *Service Forestier* (*R. Capuron*) *24853* (K, MO, P); Ouest (Nord), vestige de forêt entre Belinta et Ambetratra, au NW de Vohémer, au Sud de Maintialaka, 10–18 Dec. 1966, *Service Forestier* (*R. Capuron*) *27337* (MO, P); forêt d'Amboangisay, Canton d'Ampahano-Antalaha, 20 June 1952, *Service Forestier 133R.140* (MO); Tampolo, Fénérive, 13 Nov. 1954, *Service Forestier 12479* (MO, P), 2 Mar. 1955, *Service Forestier 13100* (BARC, P); Farankaraina, Maroahitra, 5 Mar. 1956, *Service Forestier 15711* (BARC, K, P).

Dupuya madagascariensis (R. Viguier) J. H. Kirkbride, comb. nov. Basionym: *Cordyla madagascariensis* R. Viguier, Notul. Syst. (Paris) 13: 355. 1949. TYPE: W Madagascar. Basin du Fiherenana, 400 m, Oct. 1926, *H. Perrier de la Bâthie 16617* (lectotype, designated by Du Puy & Labat (2002: 295), P not seen; isotypes, K not seen, MO not seen, P). Figures 1E, 2E, and 3E.

A tree 5–25 m tall, DBH 15–70 cm, "the bark with shallow fissures forming a net pattern, eventually flaking off in large pieces, pale grey-brown" (Du Puy & Labat, 2002: 295), youngest branches strigillose with older branches gradually becoming glabrate to glabrous. Stipules curved, falcate, narrowly acute at the apex, 3–4 × 0.2–0.7 mm, strigillose to densely so. Leaves (7–)14–22 cm long, with 15 to 44 leaflets, the rachis (6–)12–18.5 cm long, strigillose to glabrous, the petiolules 0.5–1

mm long, strigillose to glabrate, with the blade narrowly obovate to narrowly elliptic, oblique at the base, emarginated at the apex, with entire to crenate margins, (0.6–)1.4–3.6 × (0.3–)0.5–1 cm, glabrate to glabrous with hairs concentrated over the midrib and veins, "pale green (often drying darker above)" (Du Puy & Labat, 2002: 295), chartaceous. Racemes terminal, rarely axillary, or sometimes a solitary flower in the upper leaf axils, 1- or (10-to)12- to 38-flowered, 6–18 cm long, the bracts, pedicels, and bracteoles strigillose to glabrate, the bracts narrowly obovate, narrowly acute at the apex, 1.5–2.5 × 0.5–0.7 mm, the pedicels 3–6 mm long, with the bracteoles narrowly obovate, narrowly acute at the apex, 1–2 × 0.4–0.6 mm, the hypanthium expanding upward, 1.5–2 mm long, 1.1–2 mm diam. at the base and 1.5–2.5 mm diam. at the apex, glabrous to glabrate outside and glabrous inside, the calyx 4.5–5 mm long, glabrous outside and sericeous to sparsely so inside, the stamens glabrous; the filaments unequal, 9–15.5 mm long, the anthers 0.5–0.8 mm long, the staminodes 1.5–2.5 mm long, the gynoecium glabrous, the stipe 9–13 mm long, 0.5–0.7 mm diam., the ovary 3–4.5 × 1.5–2 mm, the style 1.5–4.5 mm long. Fruits ellipsoid to cylindrical to moniliform, with a beak 2–8 mm long, 3–6.5 × 2–3 cm, glabrous, with the stipe 2–3.5 cm long; seeds 15–21 × 12–13 × 9–11 mm.

Illustration. Du Puy & Labat (2002: pl. 18, B).

Common names. Anakaraka (*M. F. C. Louvel 160*, P); Hazomena (*Service Forestier* (*R. Capuron*) *3031*, P); Karabo (*Service Forestier 2838*, P); Landrazo (Du Puy & Labat, 2002); Lazaza (Du Puy & Labat, 2002); Madiroala (*Du Puy et al. M755*, P); Madivoala (Du Puy & Labat, 2002); Maimbohazo (Du Puy & Labat, 2002); Sikilihazo (Du Puy & Labat, 2002); Vaivay (Du Puy & Labat, 2002).

KEY TO SUBSPECIES OF *DUPUYA MADAGASCARIENSIS* IN MADAGASCAR

1. Stipules 3.5–4 × 0.2–0.3 mm; leaflets 17 to 30(to 40); staminodes ca. 1.5 mm long; fruit beak 5–8 mm long . . . . . *D. madagascariensis* subsp. *madagascariensis*

1′. Stipules 3–3.5 × 0.5–0.7 mm; leaflets (19 to)38 to 44; staminodes 2–2.5 mm long; fruit beak 2–5 mm long . . . . . *D. madagascariensis* subsp. *tamarindoides*

There are two subspecies recognized for *Dupuya madagascariensis* in Madagascar, one of which, the non-autonym, needs a new combination.

Dupuya madagascariensis subsp. **madagascariensis.** *Cordyla madagascariensis* var. *madagascariensis*, Adansonia, sér. 2, 8: 220. 1968. *Cordyla madagascariensis* subsp. *madagascariensis*, in Du Puy et al., Leg. Madagascar 297. 2002. TYPE: W Madagascar. Basin du Fiherenana, 400 m, Oct. 1926, *H. Perrier de la Bâthie 16617* (lectotype, designated by Du Puy & Labat (2002: 295), P not seen; isotypes, K not seen, MO not seen, P). Figures 1E, 2E, and 3E.

Illustration. Du Puy & Labat (2002: fig. 55, A–F, p. 296).

Specimens examined. MADAGASCAR. 40 km d'Ankazoabo, route Sakaraha, Feb. 1970, *J. Bosser 19956* (P); W Madagascar, Province of Toliara (Tulear), NE of Morondava, ca. 4 km NE of Andranomena, route to Marofandila, 20°9′S, 44°27′E, 30 m, 20 Oct. 1989, *D. J. Du Puy, B. P. Du Puy & J. Andriantiana M361* (K, P); W Madagascar, Toliara Province, Forest of Kirindy, ca. 60 km NNE of Morondava (Swiss Forestry Concession, "Piste Conoco"), 20°5′S, 44°37′E, ca. 30 m, 18 July 1989, *D. J. Du Puy, B. P. Du Puy & D. Baum M297* (K, P); Tulear, Tulear, Manombo, Forêt de Mikea, env. 2 km au N de Beroroha, 22°52′54″S, 43°33′25″E, 60 m, 6 Dec. 1993, *J.-N. Labat, D. J. Du Puy & S. Comtet 2463* (BARC, MO, P); Tsinembo, 21 Oct. 1932, *J. Leandri 444* (P); Trangahy, 31 Oct. 1932, *J. Leandri 481* (MO, P), *J. Leandri s.n.* (P); forêt à feuilles caduques sur calcaires de l'Antsingy, vers Ambodiriana (E d'Antsalova), 100–150 m, 21–27 Jan. 1960, *J. Leandri & P. Saboureau 2751* (MO); forêt à feuilles caduques sur calcaires de l'Antsingy, vers Andobo (E d'Antsalova), 100–150 m, 7 Feb., *J. Leandri & P. Saboureau 3037* (MO, P); forêts de l'Ouest, Anakarake, Morondava, Feb. 1923, *M. Louvel 160* (P; syntype of *Cordyla madagascariensis*); Toliara, 55 km NE of Morondava via route 8 at the forestry concession of the Centre de Formation Professional Forestière (CFPF), Kirindy Forest, 5 km E of route 8 along principal concession road (Piste CONOCO), along S boundary of forestry block, 20°4′S, 44°40′E, 35 m, 21 Mar. 1992, *R. D. Noyes, D. K. Harder, E. A. Rakotobe, T. G. Razafindrabeaza & J. P. Abraham 1053* (MO); Toliara, N of Toliara, in Forêt de Mikea, ca. 18 road-km W of Vorehe, 22°15′S, 43°25′E, 50 m, *G. McPherson, S. Razafimandimbison, M. Olsen & B. Alongi 17354* (MO); Bois de Bona (Ankazoabo) sud, Feb. 1970, *P. Morat 3574* (MO); Ankaladiny, sur la Bebibokn, July 1904, *H. Perrier de la Bâthie 1414* (P; syntype of *Cordyla madagascariensis*); sur le Manambato, Oct. 1913, *H. Perrier de la Bâthie 4240* (P; syntype of *Cordyla madagascariensis*); environs de Majunga, à Ankatsepe, Aug. 1914, *H. Perrier de la Bâthie 4749* (P; syntype of *Cordyla madagascariensis*); Toliara, Zombitsy Forest, along Route National 7, 10 km from Sakaraha, 22°54′S, 44°38′E, 650 m, 27 Feb. 1990, *P. B. Phillipson & J. R. Milijaona 3639* (MO); Toliara, Préfecture Morondava, approximately 60 km (by road) NE of Morondava, in the Kirindy Swiss forestry concession, 20°5′S, 44°38′E, 45 m, 25–31 Oct. 1990, *G. E. Schatz 2982* (MO); Ampandra, Tuleár, 22°56′S, 44°32′E, 6 Feb. 1951, *Service Forestier 2838* (P); Belo/Tsiribihina, forêt d'Andranofotsy, 8 Jan. 1955, *Service Forestier 13154* (MO); T. Ankatoky, Beroroha, 16 May 1955, *Service Forestier 13295* (MO).

Dupuya madagascariensis subsp. **tamarindoides** (Capuron) J. H. Kirkbride, comb. nov. Basionym: *Cordyla madagascariensis* var. *tamarindoides* Capuron, Adansonia, sér. 2, 8: 220. 1968. *Cordyla madagascariensis* subsp. *tamarindoides* (Capuron) D. J. Du Puy & Labat, in Du Puy et al., Leg. Madagascar 297. 2002. TYPE: N Madagascar. Plateau calcaire de l'Ankarana, environs d'Ambondromifehy, *Service Forestier* (*R. Capuron*) *3031* (holotype, P not seen; isotypes, K not seen, MO not seen, P).

Specimens examined. MADAGASCAR. District d'Ambilobe, montagne d'Andavakafanihy, calcaires de l'Ankarana, km 105 de la route d'Ambilobe, 200 m, 3 Feb. 1960, *G. Cours & H. Humbert 5620* (P); N Madagascar, Antsiranana Province, SE of Antsiranana (Diego Suarez), NW of Irodo village, Analafandrika forest, 12°38′2″S, 49°31′40″E, 60 m, 24 Mar. 1994, *D. J. Du Puy, J. Andriantiana & O. Andrianantoanina M755* (K, P); N Madagascar, Antsiranana Province, "Windsor Castle" peak near Ilomotro, NW of Antsiranana (Diego Suarez), 12°13′N, 49°10′E, 200 m, 10 June 1989, *D. J. Du Puy, B. P. Du Puy & G. Rafamantanantsoa M267* (K, P); Antsiranana, Vovo Village Distr., ca. 6 km from Diego Suarez on Diego Suarez–Vovo Village road, and ca. 1.5 km S of beach on Indian Ocean, 12°19′5″S, 49°23′7″E, 85 m, 23 Apr. 1993, *D. K. Harder, M. C. Merello, S. G. Razafimandimison & T. G. Razafinfrabaeza 1693* (MO); plateaux calcaires de l'Ankarana du nord entre Ambilobe et Anivorano, 12°57′S, 49°8′E, 200–350 m, 4–9 Mar. 1951, *H. Humbert & R. Capuron 25485* (P); Province de Diego-Suarez, collines et plateaux calcaires de l'Ankarana du nord, vers grotte du Fanihy, 30–350 m, 24 Jan.–29 Feb. 1960, *H. Humbert & G. Cours 32728* (P); Antsiranana, Ambilobe, Matsaborimanga, Réserve Spéciale gd'Ankarana, Tsingy au dessus du lac Vert, 12°55′26″S, 49°5′10″E, 300 m, 20 Nov. 1996, *J.-N. Labat, E. Randrianjohany & O. Andrianantoanina 2790* (P); Antsiranana, Ambilobe, Matsaborimanga, Réserve Spéciale d'Ankarana, piste du lac Vert, début de la zone calcaire, avant Amposatelo, 12°55′7″S, 49°5′46″E, 180 m, 21 Nov. 1996, *J.-N. Labat, E. Randrianjohany & O. Andrianantoanina 2803* (P); Antsiranana, Réserve Spéciale d'Ankarana, piste vers le lac Vert, plaque du Tsingy, 12°54′43″S, 49°6′39″E, 180 m, 18 Feb. 1994, *P. J. Rakotomalaza 142* (MO); NW Madagascar, Antsiranana province, Ankarana Reserve, 3.4 km from Ambondromifehy, 12°52′S, 49°14′E, ca. 220 m, *B. D. Schire, D. J. Du Puy & G. P. Lewis 2542* (MO, P); Marofandilia, Bevoay-Morondava, 14 Nov. 1952, *Service Forestier 6062* (P); Andranolava-Tuléar, Forêt de Vohibasia, 15 Jan. 1954, *Service Forestier 8296* (P); Montagne des Français-Diégo Suarez, *Service Forestier 12731* (K, P); District Morondava, Canton de Befasy, Pente moyenne, Anadabo, 8 Oct. 1956, *Service Forestier 16555* (MO, P).

Du Puy and Labat (2002: 297) gave the distribution of *Dupuya madagascariensis* from southwestern to northern Madagascar in seasonally dry forest with a dry season of 6 to 8 months, found up to ca. 500 m elevation, from the Forest of Sakaraha to Antisiranana. *Dupuya madagascariensis* subsp. *madagascariensis* has the largest distribution of the two subspecies throughout southern and southwestern Madagascar, and *D. madagascariensis* subsp. *tamarindoides* occurs at the northern tip of Madagascar, mainly to the north of the Ankarana and Analamerana Massifs (Du Puy & Labat, 2002: 297). *Dupuya haraka* and *D. madagascariensis* are allopatric, except for their populations on the Ankarana Massif. According to Du Puy and Moat's (2002: map 4) vegetation zones, the Ankarana Massif has both humid Sambirano forests and seasonally dry forests. The herbarium labels are not sufficient to determine the exact habitat of each species on the Ankarana Massif, but they are sympatric.

Acknowledgments. I thank the following institutions for loan of their *Cordyla–Dupuya* specimens that made this study possible: K, MO, P, and US. I also thank Amy Y. Rossman (BPI), John H. Wiersema (BARC), and two anonymous reviewers for constructive criticisms of the manuscript.

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Appendix 1. *Cordyla* Specimens Examined.

Cordyla africana Loureiro

KENYA. Lamu District, Witu Forest near Mambosasa Game Forest Post, 2°23′S, 40°32′E, 10–20 m, 20 Feb. 1977, *R. B. Faden & A. J. Faden 77/567* (BARC, MO, P); Kilifi District, Pangani, crossing of Lwandani Stream on Chonyi–Ribe road, 3°51′S, 39°41′E, 160 m, 16 Feb. 1977, *R. B. Faden, A. J. Faden, J. B. Gillett & N. Gachathi 77/447* (MO, US); Lamu District, Witu Forest, N of road, forest at northern point of reserve and up to 1 km S, 16 Nov. 1988, *S. A. Robertson & Q. Luke 5488* (K, US); Kwale District, Mrima Hill, 10 Apr. 1978, *B. Verdcourt 5274* (K). **MALAWI.** Mangochi District, Monkey Bay/Mangochi road, roadside, *J. L. Balaka, A. J. Salubeni & R. B. Kwatha 1282* (MO); Machinga District, Liwonde, roadside, 14 Aug. 1986, *A. J. Salubeni, J. L. Balaka & C. A. Musa 4699* (MO); Zomba District, Chigwere Village, Chisi Island, Lake Chilwe, Chisi Hill slopes, 10 Nov. 1986, *A. J. Salubeni & R. B. Kwatha 4850* (MO); Zomba District, Zomba Botanic Garden, edge of Mulunguzi river, 21 Oct. 1987, *E. J. Tawakali & M. S. Thera 1152* (MO). **MOZAMBIQUE.** Gaza, entre Javanhana e Caniçado, próximo do rio Limpopo, 9 Oct. 1958, *L. A. Grandvaux Barbosa 8348* (K); Province du Gorongosa, Village di Sabinga, Rivier du Vunduzi, 23 Sep. 1906, *G. Vasse 418* (P). **SOUTH AFRICA.** Zululand, St. Lucia, western shores, Hell's Gate Peninsula along side road, 30.5 m, 12 Mar. 1982, *A. Nicholas & D. MacDevette 1276* (MO). **TANZANIA.** Mtwara District, Tangazo Village, 30 km S of Mtwara on road to Maharunga and Ruvuma R. mouth, 6 Nov. 1978, *F. C. Magogo & R. R. Innes RRI476* (K); Moshi District, Moshi–Arusha road, 19 Nov. 1951, *McCoy-Hill 19* (K); Bezirk Lindi, Lutamba-See, 40 km westlich Lindi, 200–250 m, 7 Sep. 1934, *H. J. Schlieben 5267* (P); Eastern Province, Kilosa District, Old Boma, 18 Oct. 1961, *S. R. Semsei 3320* (K). **ZAMBIA.** Eastern Province, foothills E of Machinje Hills, 1000 m, 12 Oct. 1958, *N. K. B. Robson 66* (K). **ZIMBABWE.** District Mrewa, Uzumbi Tribal Trust Land, Chiore School Road, 5 Oct. 1969, *H. D. L. Corby 2138* (K); District Mrungwe, Mana Pools, Sep. 1969, *T. A. S. Gordon 44* (K); Sabi valley, above 549 m, 23 Mar. 1905, *W. M. Longden 13132* (US); Causeway, 1975, *National Botanic Garden s.n. List #50 Shipment #10* (BARC); *Weller s.n. List #95 Shipment #41* (BARC).

Cordyla densiflora Milne-Redhead

TANZANIA. Mpwapwa, 1067–1219 m, 18 June 1933, *B. D. Burtt 4755* (K); Iringa Province, Iringa, 914–1219 m, 18 Sep. 1936, *H. E. Emson 618* (K); Iringa District, Msembe, 823 m, Apr. 1970, *P. J. Greenway 4420* (K); Msembe, near the Rest House, 762 m, 5 Aug. 1969, *P. J. Greenway & Kanuri 13690* (K); Morogoro Region, Morogoro District, Ruaha gorge on Morogoro–Iringa road, 36°40′S, 7°30′E, 26 June 1986, *J. Lovett & J. Lovett 852* (K); Iringa District, Nyangolo, 16 July 1956, *E. Milne-Redhead & P. Taylor 11223* (K); Iringa District, Ruaha National Park, Kimiramatonge Hill, 823 m, 23 Oct. 1970, *H. M. Richards & S. Arasululu 26323* (BARC, K).

Cordyla pinnata (A. Richard) Milne-Redhead

GAMBIA. Near Georgetown, 10 Jan. 1927, *J. M. Dalziel 8029* (K); bords de la Gambia, Mar. 1829, *G. S. Perrottet s.n.* (P). **GUINEA.** Région de Gaoual, près Koumbia, 14 Jan. 1979, *S. Lisowski 51176* (K). **MALI.** Diondiou, 16 June 1899, *A. Chevalier 3345* (P); Kakoulou (Kayes), 11

Jan. 1937, *R. Dubois 248* (P); à 18 km de Ségou en direction de Mopti, 14 May 1989, *D. Gautier-Béguin & L. Gautier-Béguin 1414* (MO). **NIGERIA.** Province Niger, District Mokwa, 29 Dec. 1964, *D. P. Stanfield 55965* (K). **SENEGAL.** Thiès-Diourbel, Kaolack, 23 Mar. 1954, *R. P. Berhaut 4945* (P); Sédhiou (Casamance), Feb. 1900, *A. Chevalier 3537* (P), *Heudelot 367* (P); Boundou, Woulli, 1836, *Heudelot s.n.* (P); Belidjibara, 99 km après Koussaus, Sausaué, 15 Feb. 1983, *P. Lavie 1720* (P), *G. S. Perrottet 32* (P), *s.n.* (P); Km 220 entre Diourbel et Gassane, 11 Dec. 1930, *J. Trochain 1114* (P); Tambacounda-Diabougou-Vélingara, 21 June 1931, *J. Trochain 1258* (P).

Cordyla richardii Milne-Redhead

SUDAN. Waw, Bahr Al Ghazal, 28 Feb. 1926, *G. Aylmer 27/23* (K); Waw, *A. H. Braun s.n.* (K); Imatong Mountains, just S of Ngarama along the road to Molongori, near the northernmost point of the continuous chain, 700 m, 13 Mar. 1982, *I. Friis & K. Vollesen 1186* (K). **UGANDA.** West Madi district, at Metuli, 1219 m, Dec. 1931, *N. V. Brasnett 309* (K); Metu, Madi, ca. 1 mi. SW of Metu resthouse, on S side of Dzele hill, 1158 m, 5 Dec. 1947, *H. C. Dawkins 302* (K).

Cordyla somaliensis J. B. Gillett subsp. **littoralis** J. B. Gillett

SOMALIA. Merca, 29 Jan. 1954, *Bally 9527* (K).

Cordyla somaliensis J. B. Gillett subsp. **somaliensis**

ETHIOPIA. Oagden: W of Warder, 6°50′N, 44°10′E, 914 m, 16 Oct. 1953, *E. Ellis 126* (K); 10 mi. SW Warder, 16 Oct. 1954, *C. F. Henning 371* (K); 4 mi. E of Mersin, 15 July 1958, *C. F. Henning 1557* (K). **SOMALIA.** 17 km S of Gellinsoor, 520 m, 7 Feb. 1973, *P. R. O. Bally & R. Melville 16283* (K); ca. 10 km from Bula Burti to Ceel Buur, 4°0′N, 45°30′E, 15 May 1979, *A. A. Elmi & O. J. Hanson 4019* (K).

A New Species of *Rytigynia* (Rubiaceae, Vanguerieae) from Northeastern Tanzania, with Notes on the Circumscription of the Genus

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Abstract. We discuss the history and circumscription of the genus *Rytigynia* (Rubiaceae, Vanguerieae) and present the morphological characters used for the delimitation of the genus in a new, restricted sense. We describe *Rytigynia dichasialis*, a new species from northeastern Tanzania that is unique in the genus by having long-pedunculate and dichasially cymose inflorescences with well-developed secondary axes. We compare the new species to other, morphologically similar species of *Rytigynia* and present the characters used to distinguish among them.

Key words: Rubiaceae, *Rytigynia*, Tanzania, Usambara Mountains, Vanguerieae.

The Vanguerieae are a tribe of ca. 600 species in the family Rubiaceae with a distribution in Africa, Madagascar, South and Southeast Asia, the Pacific, and Australia. The center of diversity is in East Africa, and these are also the species that have been studied most extensively. In the treatment of this tribe for the *Flora of Tropical East Africa* (Verdcourt & Bridson, 1991) and in the publications that laid the foundation for this work (Bridson, 1985, 1986, 1987a, 1987b; Verdcourt, 1981, 1987), the current circumscriptions of most of the genera were established and a large number of new species were described. Both specific and generic delimitations in the tribe are notoriously difficult. Lantz et al. (2002) and Lantz and Bremer (2004) have shown that 5 of the 27 currently recognized genera are para- or polyphyletic, and several other genera lack readily observable diagnostic characters.

Rytigynia Blume (1850), a genus of about 60 species with a widespread distribution in Africa and Madagascar, is one of these problematic genera in Vanguerieae. Phylogenies based on molecular data (Lantz et al., 2002; Lantz & Bremer, 2004) have shown that *Rytigynia* s.l. (e.g., Verdcourt, 1987) consists of a core group of species, here referred to as *Rytigynia* s. str., that are closely allied to *Fadogia* Schweinfurth, *Fadogiella* Robyns, and *Hutchinsonia* Robyns. However, *Rytigynia* s.l. also includes some species more closely related to other genera (as noted by Verdcourt & Bridson, 1991: 803). For example, *Rytigynia bugoyensis* (K. Krause) Verdcourt and *R. mrimaensis* Verdcourt are more closely related to the type species of *Canthium* Lamarck, *C. coromandelicum* (Burman f.) Alston, than to other species of *Rytigynia*. Both species have supra-axillary spines, often in combination with brachyblasts, a diagnostic character of *Canthium* s. str., to which genus both have recently been transferred (Lantz & Bremer, 2004). *Rytigynia fuscosetulosa* Verdcourt, a species with linear calyx lobes that is currently placed in *Rytigynia* subg. *Sali* Verdcourt, is closely related to *Vangueria* Jussieu (Lantz & Bremer, 2004) and should not remain in *Rytigynia* s. str. (Lantz & Bremer, in prep.).

Traditionally, *Rytigynia* s.l. has been delimited by a lack of characters present in other genera of Vanguerieae rather than by unique diagnostic characters of its own. In practice, *Rytigynia* s.l. has included shrubby species with few-flowered inflorescences lacking the most obvious characters of the plurilocular genera related to and including *Vangueria*. The vaguely defined combination of characters used in its circumscription has evolved multiple times in the tribe, and *Rytigynia* s.l. is thus polyphyletic. Also complicating the circumscription of *Rytigynia* is the equally vague circumscription of *Canthium* s.l. (shown to be polyphyletic by Lantz & Bremer, 2004), with focus only on the bilocular ovaries, which has made it difficult to dis-

tinguish between this genus and *Rytigynia*. It is sometimes unclear on which basis the species are referred to one genus or the other, as in the above-mentioned *Rytigynia bugoyensis* and *R. mrimaensis*.

With the knowledge of the phylogeny of the tribe based on molecular data (Lantz et al., 2002; Lantz & Bremer, 2004), *Rytigynia* s. str. is morphologically delimited by the following combination of characters: shrubs or small trees; leaves persistent; domatia often present (on abaxial leaf surface in axils of secondary nerves, the normal position in Vanguerieae); inflorescences usually shortly pedunculate (≤ 5 mm) and with poorly developed secondary axes; calyx truncate or very shortly toothed; and ovaries bi- or plurilocular. The truncate or very shortly toothed calyx is of special importance to distinguish *Rytigynia* s. str. from *Rytigynia* s.l. Some species of *Afrocanthium* (Bridson) Lantz & Bremer (e.g., *Afrocanthium pseudoverticillatum* (S. Moore) Lantz; see Lantz & Bremer, 2004) match much of this description, but these are without exception deciduous. Thus any species currently placed in *Rytigynia* s.l. but deviating from this description are likely candidates for exclusion from the genus, though we will await molecular data before any more transfers are made. However, only a small number of the remaining *Rytigynia* species will be excluded from *Rytigynia* s. str. and further transfers will not change the geographic distribution of *Rytigynia*; *Rytigynia* s. str. is widespread in Africa and Madagscar.

During the identification of a large number of Vanguerieae specimens collected during the Tanzania Botanical Training Programme, the first author discovered an undescribed species that could only be identified to genus with difficulty. The combination of 3-locular ovaries, domatia, and a truncate calyx clearly indicate a position in *Rytigynia* s. str., but the many-flowered inflorescences with well-developed cymose branching are not known from other species in the genus. The specimen represents a new species of *Rytigynia* s. str. exhibiting hitherto unknown features in the genus in this restricted sense.

Rytigynia dichasialis Lantz & Gereau, sp. nov. TYPE: Tanzania. Tanga Region: Muheza Dist., Amani East Forest Reserve, near edge of road, 5°05′36″S, 38°36′01″E, 500 m, 29 Jan. 1999, *A. Ntemi Sallu 247* (holotype, NHT; isotypes, BR, K, MO, UPS, eucfp (reference collection of East Usambara Catchment Forest Project)). Figure 1.

Haec species quoad stipulas longe appendiculatas bracteas connatas cupuliformes etiam florium aspectum ad *Rytigyniam monantham* maxime accedit, sed ab ea foliis majoribus atque inflorescentiis 5- ad 14- (nec 1- vel 2-) floris, a congeneris ad *Rytigyniam* sensu stricto pertinentibus inflorescentia dichasiali pluriflora (nec fasciculata subumbellata umbellatave plerumque pauciflora) perfacile distinguitur.

Shrub ca. 2.5 m tall; twigs light brown, lenticellate, densely short-pubescent with straight to somewhat curved or wavy trichomes when young, glabrescent with age; bark smooth. Stipules with basal parts connate into a sheath 2.0–2.5 mm long with trichomes present within, lower part of sheath pubescent externally, upper part glabrous and shiny, each stipule with free apical filiform appendage 5–7 mm long, soon deciduous; petiole 2–4 mm long; leaf blade ovate to ovate-oblong, 4.7–10.5 cm long, 1.5–4.4 cm wide, L/W = 2.3–3.1, long-acuminate and minutely apiculate at apex, acute to obtuse and sometimes asymmetric at base, with short adpressed to somewhat spreading trichomes with papillose-swollen bases above, with slightly longer epapillose trichomes beneath, denser than above but surface not obscured, the costa and secondary nerves more densely pubescent; secondary nerves 4 to 6 on each side of costa, eucamptodromous at base to weakly brochidodromous at apex; domatia present as tufts of white trichomes in axils of secondary nerves. Inflorescence axillary, 5- to 14-flowered, cymose (dichasial), all parts shortly pubescent; peduncle slender, 7–13 mm long; bracts and bracteoles present as connate sheaths or sometimes free, then ovate to lanceolate; dichasium with 2 or 3 orders of branching, the central solitary flower apparently always present, the lateral secondary and/or tertiary axes often reduced and somewhat monochasial; pedicels 4–6 mm long in flower, elongating to 17 mm in fruit. Flower buds acuminate, glabrous or with a few short trichomes on outside of corolla lobes, slightly constricted below lobes; calyx tube obovoid, 1.0–1.8 mm long, short-pubescent, limb tube 0.2–0.3 mm long, glabrous, truncate or somewhat undulate-crisped and thus appearing very slightly toothed; corolla 5-merous, cream, glabrous outside at anthesis, the tube ca. 2 mm long with deflexed trichomes attached at throat inside, these rather straight but usually somewhat curled toward rounded apices, the throat with a smooth rather cartilaginous ring, the lobes 4–5 mm long, narrowly triangular, the apex acute with apiculum ca. 1 mm long; anthers 5, inserted in corolla throat with upper half visible, dorsal side without darkened connective; ovary 3-locular; style exserted 1.0–1.2 mm from corolla throat; stigmatic club green, cylindrical, 1.0–1.2 mm long, with pro-

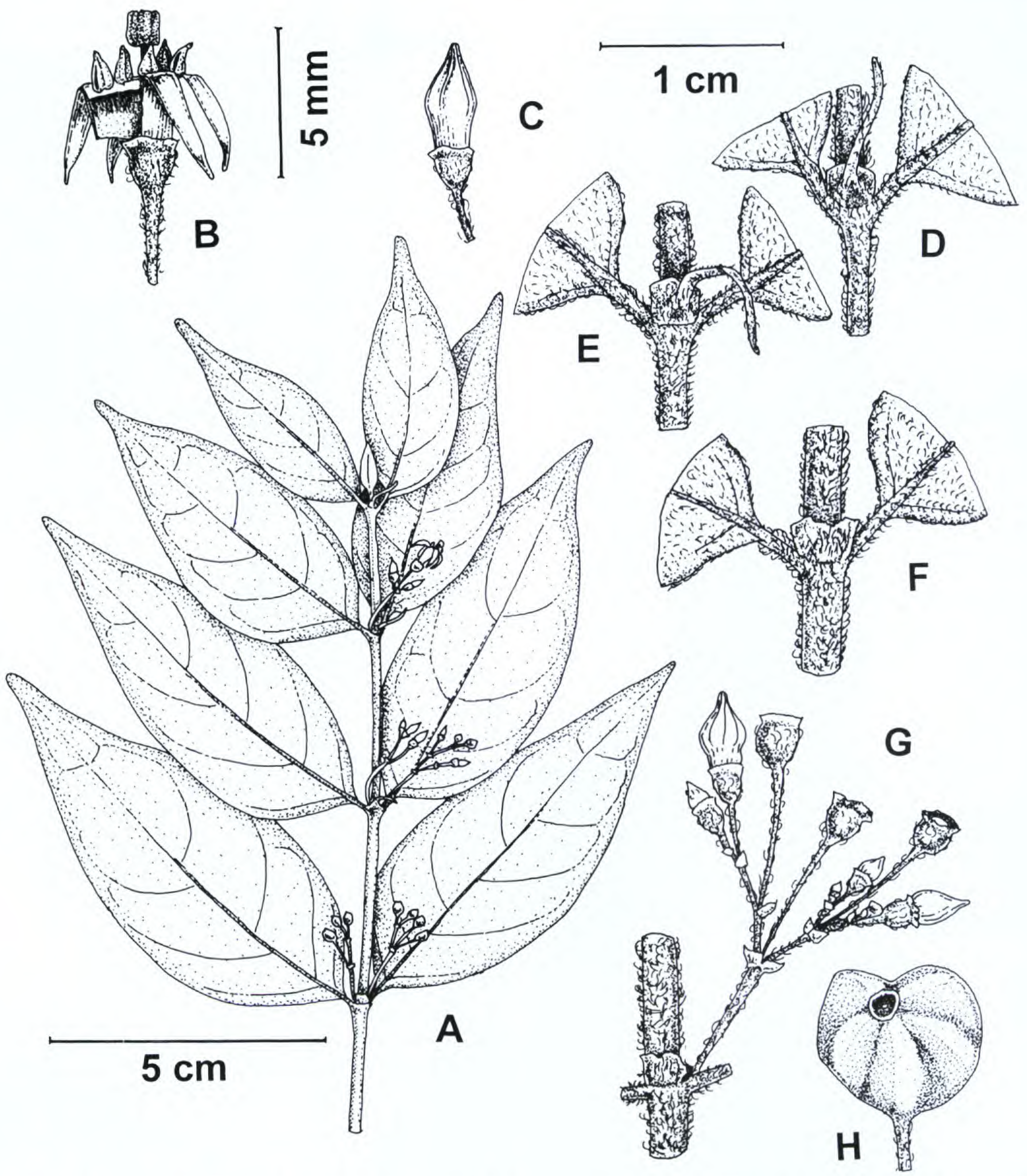

Figure 1. *Rytigynia dichasialis* Lantz & Gereau. —A. Flowering plant, habit. —B. Flower, with corolla opened to show internal trichomes. —C. Flower bud. —D, E. Node of twig with leaf bases and stipule with appendage. —F. Node of twig with stipule, appendage fallen. —G. Node with stipule and one inflorescence (of two). —H. Immature fruit. A–F and H based on isotypes at BR, K, and MO; inflorescence detail G based on isotype at UPS.

nounced ridges, 3-lobed at apex. Immature fruit subglobose, to 6 mm long and 7 mm wide, glabrous, with 3 pyrenes.

This species is unique in the genus in its relatively long-pedunculate and several-flowered inflorescences with well-developed branching. The most mature flowers and fruits consistently appear in a terminal position, indicating a determinate and essentially cymose inflorescence type that is best described as a dichasium, though with some of the secondary and/or tertiary branches often reduced and monochasial. This inflorescence condition is unique in *Rytigynia* s. str., which characteristically has inflorescences that are fasciculate or shortly pedunculate and umbellate or subumbellate, and rarely have more than four flowers. The mostly connate bracts and bracteoles of this new species are also distinctive. Similar bracts and bracteoles are known from several other species in the genus, although the larger number of flowers in *R. dichasi-*

alis makes them more noticeable. Sterile specimens of *R. dichasialis* could be confused with *R. monantha* (K. Schumann) Robyns, which is quite similar to *R. dichasialis* in characters of leaf shape, long-appendaged stipules, bracts, bracteoles, and flowers. However, *R. dichasialis* has larger leaves (to 10.5 × 4.4 cm in *R. dichasialis* vs. to 6 × 4 cm in *R. monantha*) and is only known from the type locality at an elevation of 500 m in northeastern Tanzania, while *R. monantha* is known from elevations of 775–1940 m and is widespread in Burundi, Rwanda, Malawi, Tanzania, and Zambia. A poorly known species from Malawi, *R. pawekiae* Verdcourt, shares a similar number of flowers per inflorescence with *R. dichasialis*, but is differentiated by smaller, more densely pubescent leaves, peduncles only up to 4 mm in length, inflorescences congested and subumbellate, and external trichomes present on the corolla lobes at anthesis. *Rytigynia dubiosa* (De Wildeman) Robyns, known from Cameroon, the Democratic Republic of the Congo, and Uganda, has inflorescences with up to 16 flowers (Verdcourt & Bridson, 1991: 810), but has subumbellate inflorescences with short peduncles (up to 6 mm) and glabrous leaves.

Rytigynia dichasialis is known only from the type collection. Amani East Forest Reserve was originally gazetted in 1955 (Iversen, 1991: 30), and was the smallest of the six forest reserves that were combined in 1997 to create the Amani Nature Reserve (Doody et al., 2001: 6), the largest bloc of forest in the East Usambara Mountains. Of the 264 species of trees and shrubs recorded from vegetation plots in the Amani Nature Reserve, 19 (7.2%) are endemic to the Usambara Mountains, and 11 (4.2%) are endemic to the East Usambara Mountains; the Reserve thus contains a significant proportion of regionally restricted species within an area of only 83.6 km² (Doody et al., 2001: 62). Like most continuous forest blocs ranging from lowland to submontane forest in the Eastern Arc Mountains, the Amani Nature Reserve is particularly rich in Rubiaceae. The East Usambara Mountains have had a history of moderately intensive botanical research and collection dating back at least to 1892 (see Iversen, 1991: 1–11), but nevertheless there remain new taxa to be discovered among existing and future collections.

Acknowledgments. We are greatly indebted to Charlotte Taylor for the illustration and insightful comments on earlier versions of the manuscript. We sincerely thank Albert Ntemi Sallu for having collected this probably rare species in the field, and Nike Doggart of the Tanzania Forest Conservation Group for valuable information about the Amani Nature Reserve.

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Validation of *Mimulicalyx paludigenus* (Scrophulariaceae), a Species Endemic to China

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ABSTRACT. In the course of writing the account of Scrophulariaceae for the *Flora Yunnanica*, it was noticed that one species of *Mimulicalyx*, *M. paludigenus*, described from Yunnan Province, southwestern China, in 1979 was invalid because two type specimens (one fruiting, one in flower) were designated. The name is validated here, with the fruiting specimen designated as the holotype.

Key words: China, *Mimulicalyx*, Scrophulariaceae, validation.

Mimulicalyx P. C. Tsoong has been described as a genus endemic to China by Tsoong (1979) in his account of Scrophulariaceae in the Chinese-language *Flora Reipublicae Popularis Sinicae, Tomus 67*. Up to now only two species, *M. rosulatus* P. C. Tsoong and *M. paludigenus*, were recorded in this genus. While preparing the account of Scrophulariaceae for the *Flora Yunnanica*, we found that a nomenclatural mistake existed in *M. paludigenus*. Two specimens, representing flowering and fruiting stages, were designated as types simultaneously (Tsoong, 1979). The name, therefore, did not accord with Article 37 of the *International Code of Botanical Nomenclature* (Zhu, 2001) and made the name *Mimulicalyx paludigenus* Tsoong invalid. Unfortunately, this problem was not discovered in the English and updated edition of the *Flora of China* (Hong et al., 1998). The specimen that represented flowering material could not be found during re-examination, so *Mimulicalyx paludigenus* is validated here by reference to the previously published diagnosis by Tsoong (1979) and by designating the fruiting specimen, *C. W. Wang 81476*, as the holotype.

Mimulicalyx paludigenus P. C. Tsoong ex D. Z. Li & J. Cai, sp. nov. TYPE: China. Yunnan: Mong-tze Hsien, Shau-shin-jay, 1400 m, 5 Sep. 1935 (fr), *C. W. Wang 81476* (holotype, PE).

Latin diagnosis: Tsoong, in Flora Reipublicae Popularis Sinicae 67(2): 400. 1979.

Although the holotype of *Mimulicalyx paludigenus*, which represents merely the fruiting stage, does not exhibit floral characters, it is easy to distinguish the pair of species by their vegetative characters. In *M. paludigenus*, leaves are 3–4 cm long, borne on the stems oppositely and are mostly amplexicaulous except the basal one or two pairs with 0.4 cm long petioles; the margin is entire or with a few small teeth; the pedicel is longer than the bract, and to 4 cm long or longer at the fruiting stage. In *M. rosulatus*, basal leaves are in a cluster and more than 4 cm long with a 1–1.5 cm long petiole; cauline leaves are 0.8–2.5 cm long and amplexicaulous; bracts are conspicuously shorter than pedicels, but the pedicel is usually not more than 3 cm long at the fruiting stage.

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Notes on Succulent *Cynanchum* (Apocynaceae, Asclepiadoideae) in East Africa

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ABSTRACT. Changes in succulent *Cynanchum* L. species are needed for the *Flora of Somalia* account of Apocynaceae subfamily Asclepiadoideae. The following changes are proposed within the tribe Asclepiadeae, subtribe Cynanchinae. *Cynanchum viminale* subsp. *crassicaule*, another subspecific taxon in the *C. viminale* complex, is described as new, based on morphological, ecological, and molecular evidence. Its chromosome number is specified with $2n = 22$. The new combination *Cynanchum viminale* subsp. *stipitaceum* is proposed, and *Sarcostemma andongense* Hiern is recognized as a new synonym of *C. viminale* subsp. *stipitaceum*.

Key words: Africa, Apocynaceae, Asclepiadeae, Asclepiadoideae, Cynanchinae, *Cynanchum*, Kenya, *Sarcostemma*, Somalia.

Recently it has been shown that the African members of *Sarcostemma* R. Brown are nested in the succulent Cynanchum clade, which further nests within/among the Madagascan *Cynanchum* species (Liede & Kunze, 2002). Meve and Liede (2002) therefore concluded that Madagascar is the center of origin for taxa previously summarized under *Sarcostemma* and that the taxonomic difficulties in the *Cynanchum viminale* complex reflect the ambiguity associated with a comparatively young, rapidly evolved and still evolving taxon. Nevertheless, the traditional concept that florally distinctive taxa are recognized at the specific level, while florally similar but vegetatively distinctive taxa are considered subspecies under *Cynanchum viminale* (Liede & Meve, 1995; Meve & Liede, 1996), is still a valid approach to handle diversity in this group. A recently conducted RAPD analysis (Liede & Meve, unpublished) supports an infraspecific concept for *C. viminale*. While the unraveling of the *Cynanchum* complex as a whole has to wait for the conclusion of this analysis, the upcoming publication of the *Flora of Somalia* makes it necessary to publish here a new subspecies within the *Cynanchum viminale* complex.

Cynanchum viminale L. subsp. **crassicaule** Liede & Meve, subsp. nov. TYPE: Kenya. Taita Distr.: SW side of Mt. Kasigau, 1150 m, 12 Feb. 1996, *D. J. Goyder, P. S. Masinde, U. Meve & C. Whitehouse 4029* (holotype, K; isotypes, EA, UBT in alcohol). Figure 1.

Cynancho viminali typico affinis sed habitu non-tortuoso arcuato, caulibus crassis, inflorescentibus sessilibus extra-axillaribus et terminalibus, gynostegio conspicue lato differt.

Plants erect to decumbent, sarmentose (arching over the ground or scandent in bushes), non-twining, richly irregularly branched; subterranean organs consisting of fibrous roots; *shoots* perennial, succulent, prominently glaucous, sparsely glabrescent over the entire surface with flexuous trichomes, 600–800 μm long; *internodes* cylindrical, 4–20 cm long, 6–11 mm diam.; *latex* white, caustic (fide P. Powys, Kenya, pers. comm.). *Leaves* reduced to scales, not caducous, sessile, blades fleshy when young, papery when old, 1.4–2 mm long, ca. 1.5 mm wide, triangular-deltate. *Inflorescences* always one per node, extra-axillary and terminal, growth continued beyond inflorescence, 5- to 10-flowered, all flowers open synchronously, sciadioidal, sessile. *Flowers* faintly unpleasantly scented; *floral bracts* ca. 0.8 mm long, ca. 0.6 mm wide at the base, triangular, with trichomes; *pedicels* 5–7 mm long, densely covered over the entire surface with flexuous trichomes, 600–800 μm long; *floral buds* 5–6 mm long, 5 mm diam., conical; *calyx* basally fused, abaxially with trichomes, lobes 1.2–1.5 × 1–1.2 mm, triangular-deltate, apically acute; *corolla* 6–8 mm long, cream to bright yellow; lobes 2.5–3 mm wide, patent, oblong, apically acute, with revolute margins. *Gynostegial corona* ivory in color, of free staminal lobes (Cs) connate to a ring of staminal and interstaminal parts [C(is)]; staminal corona (Cs) 1.5–1.8 mm high, equaling the gynostegium, lobes unguiculate, filled with loose parenchyma; ring of staminal and interstaminal parts [C(is)] 1–1.2 mm high, shorter than the gynostegium, cyathiform. *Gynostegium* 2.6–3 mm high, 4–4.5 mm diam., sessile; *stamens* with filament of 800 μm length, an-

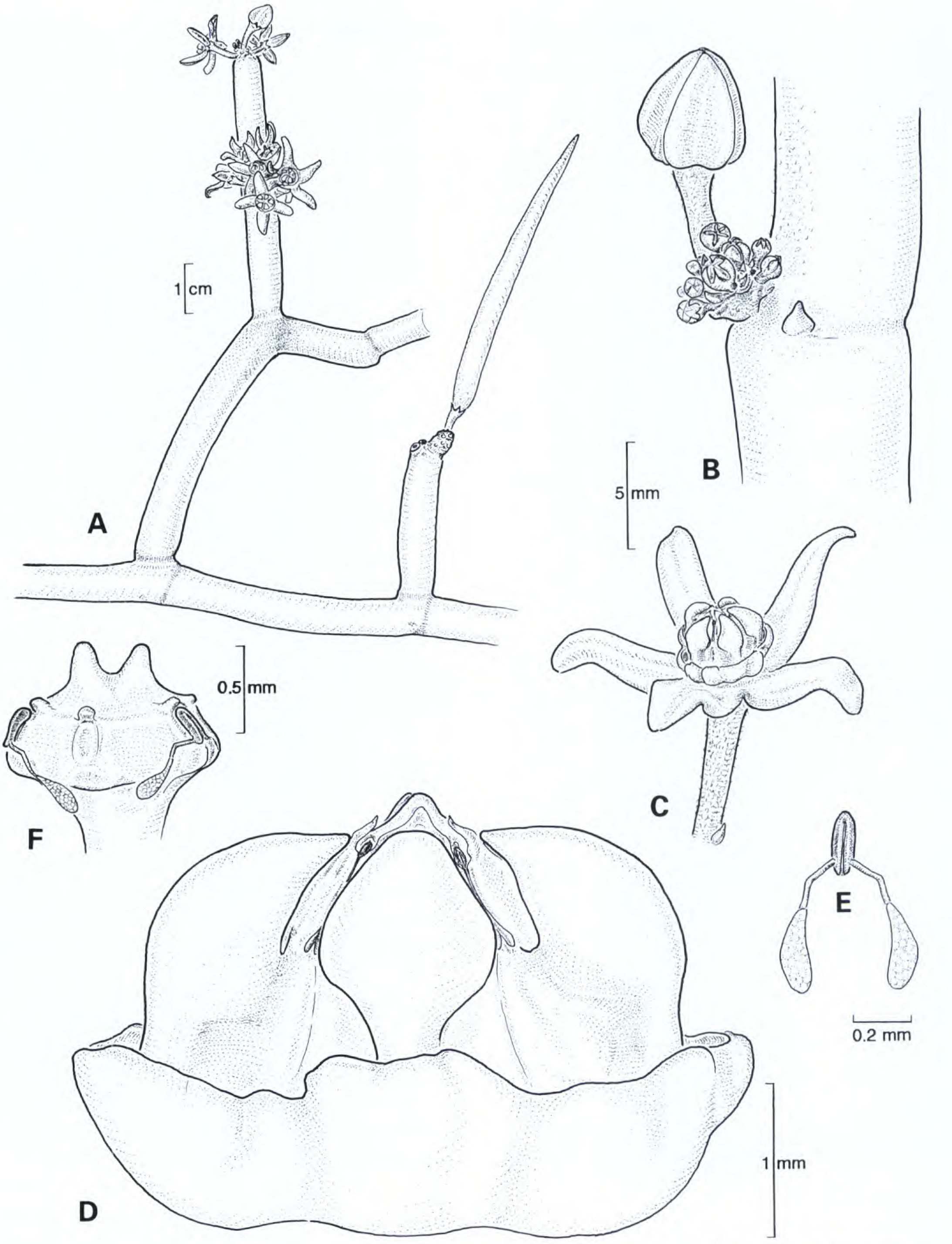

Figure 1. *Cynanchum viminale* L. subsp. *crassicaule* Liede & Meve. —A. Habit, with flowering (left) and fruiting stems (right). —B. Budding extra-axillary inflorescence. —C. Flower. —D. Gynostegium with corona in lateral view. —E. Pollinarium. —F. Style-head with two pollinaria attached. (Drawn by U. Meve from the type, *Goyder et al. 4029*. A drawn from a photograph of the type plant taken at the type locality; B–F drawn from alcohol material of the isotype in UBT.)

thers about as long as broad, trapezoidal, abaxially planar; anther wings 700 μm long, convergent, consisting of distal ridge alone; anther wings of adjacent anthers parallel to each other, basally widened, centrifugal; *connective appendages* 0.5–0.6 × 0.4–0.5 mm, triangular, narrower than the stamen, slightly inflexed. *Pollinarium*: corpusculum 220–240 μm long, elliptic, margins of the corpuscular cleft parallel; caudicles 200 μm long, (sub-)basally inserted at the corpusculum, cylindrical, geniculate; pollinia apically attached to the caudicles, pendulous, 300 μm long, 100 μm wide, elliptical in cross section, clavate. *Style-head* white, 1.2–1.3 mm diam., 0.8–1 mm long, upper part 0.4–0.5 mm long, equaling the lower part, bifurcate. *Follicles* always one per flower, 60–100 mm long, 4–5 mm diam., narrowly oblong, round in cross section, apically acute, but not beaked, with sparse indumentum; *seeds* 6–7 mm long, 2.5–3 mm wide, ovate, light brown; seta side smooth, aseta side with patchily arranged trichomes, 50 μm long; marginally with 0.5–0.7 mm wide wing with entire margin; coma 20–25 mm long.

Chromosome number. $2n = 22$ (vouchers: *Goyder et al. 4029, Liede & Newton 3173*).

Phenology. Flowering and fruiting from February to November.

Habitat and distribution. *Cynanchum viminale* subsp. *crassicaule* occurs at altitudes of around sea level close to shore up to the higher foot of Mt. Kilimanjaro at ca. 1400 m a.s.l. Typically it grows in *Acacia* savanna and scrub of semi-arid to arid habitats in Tanzania, Kenya, Uganda, and Somalia.

Conservation status. *Cynanchum viminale* subsp. *crassicaule* cannot be regarded as threatened because it is comparatively widespread. However, where it occurs, it is usually not as frequent as most of the other subspecies of *C. viminale* (including subsp. *stipitaceum*).

Cynanchum viminale subsp. *crassicaule* is not only morphologically distinctive, but also the three representatives included in a recently undertaken, but still unpublished, RAPD analysis form a reasonably well supported group. The habit of *C. viminale* subsp. *crassicaule* is quite conspicuous since it is non-twining, arching over the ground for up to 2 m or scandent in and over bushes. With glaucous and strictly cylindrical stems that reach up to 11 mm in diameter, its stem morphology differs from all other subspecies of *C. viminale*; the stems are the thickest known in all former *Sarcostemma*. The flowers are also comparatively large for former *Sarcostemma*, reaching 15 mm in diameter; however, most significant are the dimensions of the

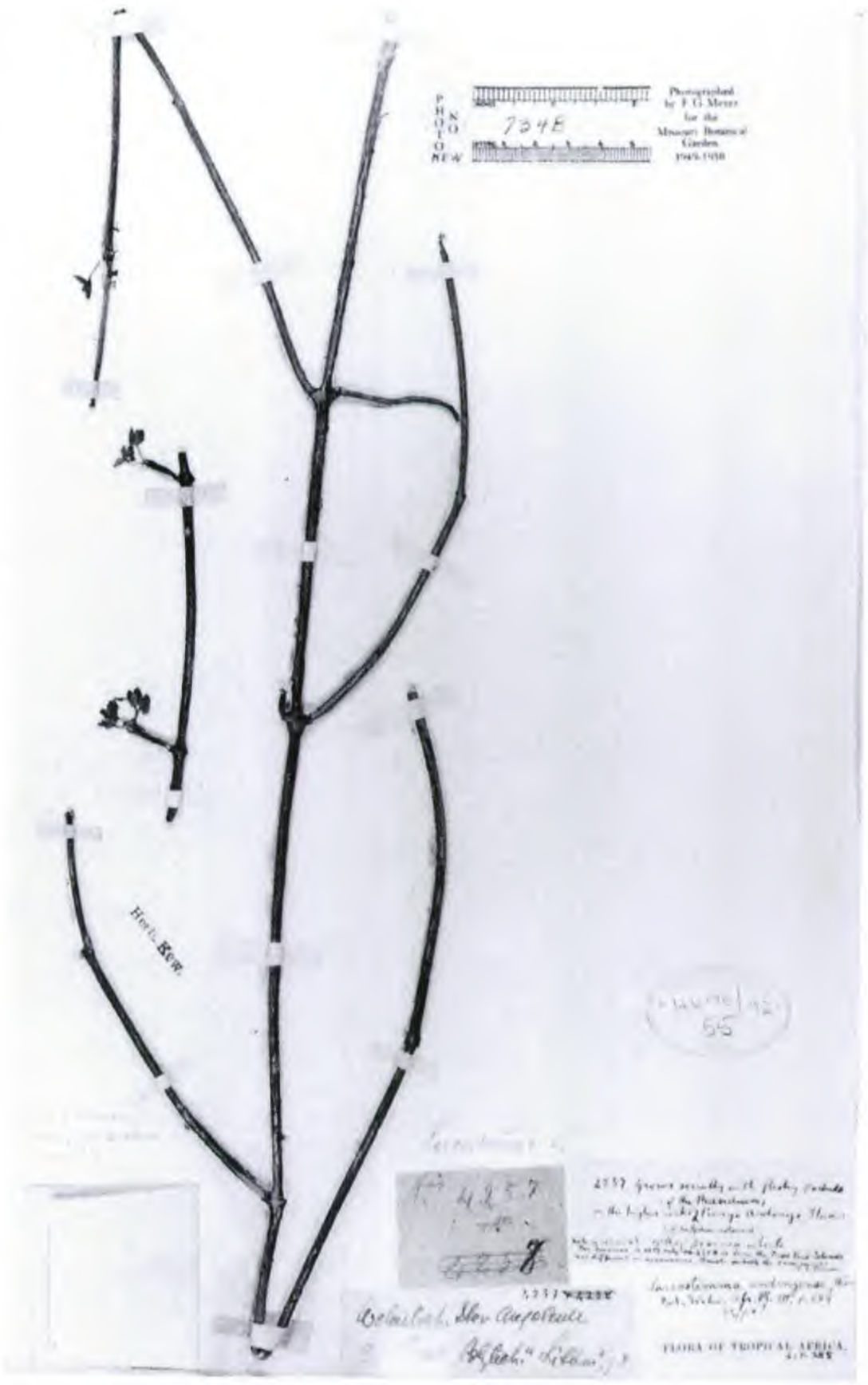

Figure 2. Holotype (*Welwitsch 4257*, K) of *Sarcostemma andongense* Hiern, referred herein to *Cynanchum viminale* subsp. *stipitaceum*.

gynostegium (including corona). The enormous width with respect to *Cynanchum* or *Sarcostemma* of up to 4.5 mm in diameter contrasts to the modest length, which is ca. 2.7 mm (Fig. 1D); this results in a length/width quotient of around 0.6. In no other taxon of former *Sarcostemma* is such a low length/width quotient, meaning such a flat gynostegium, known. In *C. viminale* subsp. *brunonianum* (Wight & Arnott) P. I. Forster the gynostegium is only a little less flat (length/width quotient around 0.7), but this is a non-African taxon and its flowers never reach more than 10 mm in diameter. In all African taxa of the *C. viminale* complex, the length/width quotient lies between 0.77 and 1.0 (Meve & Liede, unpublished data). In Rumuruti (Laikipia Plateau, Kenya), where *C. viminale* subsp. *crassicaule* occurs among other former "*Sarcostemma*" taxa (*C. viminale* subsp. *suberosum* Meve & Liede, *S. stoloniferum* Adams & Holland), grazing animals disdain subspecies *crassicaule* because of its caustic latex, while the other taxa are eaten.

The name *Sarcostemma andongense* Hiern has been frequently misapplied to *C. viminale* subsp.

crassicaule (e.g., Blundell, 1987: 149, fig. 225; Schultz & Powys, 1998). However, the name *S. andongense* refers to a taxon originally described from Angola (Fig. 2), which we recognize as a synonym of *C. viminale* subsp. *stipitaceum* (Forsskål) Meve & Liede (see below). Most obvious, the inflorescences are typically stipitate in subspecies *stipitaceum* (cf. Fig. 2), whereas they are sessile in subspecies *crassicaule* (Fig. 1B).

Paratypes. KENYA. **Kitui Distr.:** Mutoma Hills, *D. Cumming 393* (UBT, in cult.). **Laikipia Distr.:** Powys' farm nr. Rumuruti, *S. Liede & L. E. Newton 3173* (ULM); Ol Doinyo Lossos, *L. E. Newton s.n.* (K). **Machakos Distr.:** Lukenya, *P. R. O. Bally 119* (K). **N Frontier Distr.:** Ol Lolokwe, *M. G. Gilbert 5371* (K). **Turkana Distr.:** Lokitaung Gorge, *S. Carter & B. Stannard 125* (K). SOMALIA. **Jubbada Hoose Distr.:** Dick's Head (Ras Chiamboni), *J. Adamson sub P. R. O. Bally 5938* (K). TANZANIA. **Moshi Distr.:** Kilimanjaro, Nanuai Farm, *J. M. Grimshaw 9413* (K). UGANDA. **Karamoja Distr.:** Dodoth county, ca. 5 mi. West Loyoro on Koputh and Rom rd., *H. C. Dawkins 647* (FHO).

Cynanchum viminale L. subsp. **stipitaceum** (Forsskål) Meve & Liede, comb. nov. Basionym: *Asclepias stipitacea* Forsskål, Fl. Aegypt.: 50. 1775. *Sarcostemma stipitaceum* (Forsskål) Schult., Syst. Veg. (ed. 1) 6: 116. 1820. *Sarcostemma viminale* (L.) R. Br. subsp. *stipitaceum* (Forsskål) Meve & Liede, Bot. J. Linn. Soc. 120: 32. 1996. TYPE: Yemen. Milhan, *P. Forsskål s.n.* (holotype, C).

Sarcostemma andongense Hiern, Cat. Afr. Pl.: 689. 1898. Syn. nov. TYPE: Angola. Pungo Andongo, more elevated rocky places in the praesidium, Dec. 1856, *F. M. J. Welwitsch 4257* (holotype, K). Figure 2.

Acknowledgments. We thank David Goyder (K) and Siro Masinde (EA) for help with specimen information. SL-S thanks Len Newton, UM thanks David Goyder, Siro Masinde, and Chris Whitehouse for pleasant companionship in the field. For loan of specimens, we thank the directors of EA, FHO, and K.

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Leucocoryne talinensis (Alliaceae), a New Species from Chile

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ABSTRACT. A new species from Chile, *Leucocoryne talinensis*, is described and illustrated. It is known from Talinay and Fray Jorge in Limarí Province, from roadsides and adjacent fields. Its chromosome number and relationship to the most closely related species are discussed.

RESUMEN. Se describe e ilustra una nueva especie de Chile, *Leucocoryne talinensis*, conocida de las localidades de Talinay y Fray Jorge (Provincia de Limarí, 30°S), donde crece a orillas de la carretera y en campos adyacentes. Se da a conocer su número cromosómico y se discute su relación con la especie más cercana.

Key words: Alliaceae, Chile, chromosome number, *Leucocoryne*.

The genus *Leucocoryne* Lindley (Alliaceae) is endemic to Chile and is comprised of about 15 to 20 taxa (Rahn, 1998). It grows from the Atacama desert in Region I of Tarapacá near the city of Iquique (20°S) in northern Chile (Pinto, 1999), to the humid Lake District Region X de Los Lagos of southern Chile (39°S) (Muñoz, 2000).

It appears that the center of diversity for the genus lies between the Regions of Coquimbo and Valparaíso, specifically between the cities of Valparaíso (33°S) to north of La Serena (29°S) from sea level to 2800 m a.s.l. In this area approximately 75% of the described species are found. In addition, this area has some taxonomically undescribed populations (Mansur, 2004; Zoellner, 1972).

The genus presents great morphological variability, shown especially in floral structure, which causes difficulties in its taxonomic classification (Mansur, 2004; Muñoz, 2000).

Leucocoryne talinensis L. Mansur & M. Cisternas, sp. nov. TYPE: Chile. Limarí: Talinay, cultivated at Quillota from material collected 17 Nov. 1997, along Highway 5, km 355, 30°49′S, 71°33′W, type prepared 10 Aug. 2000, *L. Mansur 1* (holotype, CONC; isotype, SI). Figure 1.

Ex affinitate *L. odoratae*, floribus magnis differt. Pedicelli inaequales, 1.3–3.7 cm longi; perianthium tubo cylindrico et basi globosa; tepala ovali-lanceolata ad apicem leviter acuminata, 10–16 mm longa et leviter reflexo-cochleariformia; staminodia patentia, luteola et cylindrica ad apicem obtusa 3.4–7 mm longa; ovarium tricarpelare, stylus brevis et persistens. Capsula oblonga et leviter rostrata.

Herbaceous scape 16–30 cm tall; bulbous geophyte, perennial; bulbs tunicate, with strong garlic odor, creamy-white, globular, 12–21 mm high, 11–19 mm diam. covered with grayish white cataphylls. Leaves 4 to 5, all basal, linear, slightly canaliculate, 12–18 × 1.2–2.5 cm. Spathes 2, membranous and dry at anthesis, 1.6–2.5 × 2.0–4.0 cm, with a prominent central vein and 8 secondary veins. Inflorescence a pseudo-umbel, with (3)4 to 8(9) white flowers; pedicels unequal, 1.3–3.7 cm long. Perianth with a cylindrical tube, dilated at the base, 6.9–11 × 2.0–4.5 mm, white, with 6 brown-violet veins running longitudinally; tepals 6 arranged in 2 series, ovate-lanceolate, acute, unequal, 3.7–8 × 10–16 mm, entire to erose, acute apex, with a greenish central vein; tepals slightly spatulate and reflexed; stamens 3, fertile; anthers sessile, 1.50–1.55 mm long, yellow, adnate to the tube of the perianth above the pistil; staminodes 3, patent, fleshy, broadly acute, 3.4–7.0 × 1.0–1.7 mm, creamy yellow, at the base of the interior tepals; tricarpellate ovary, with axial placentation; stigma capitate-papillate; style persistent and short with 3 septal nectaries at the base of the ovary. Capsule oblong, slightly rostrate, 9.5–14.8 × 4.0–4.8 mm; seeds black and small, 36.6 ± 1.1 mg 50^{-1}, crenulate, irregularly rounded and appendaged.

Habitat and distribution. The new species is known from Talinay, where it grows along Highway 5 and in adjacent fields with populations of *Leucocoryne purpurea* Gay at 250–300 m a.s.l., in alluvial, sandy-loam soils (Rodríguez, 1990). *Leucocoryne talinensis* is also occasionally found in the upper part of the Fray Jorge National Park in Chile. *Leucocoryne talinensis* was originally collected in 1997 and cultivated in Quillota, where the type collection was prepared in 2000.

The new species is exposed to damaging human activity, such as plantings of exotic *Atriplex* species,

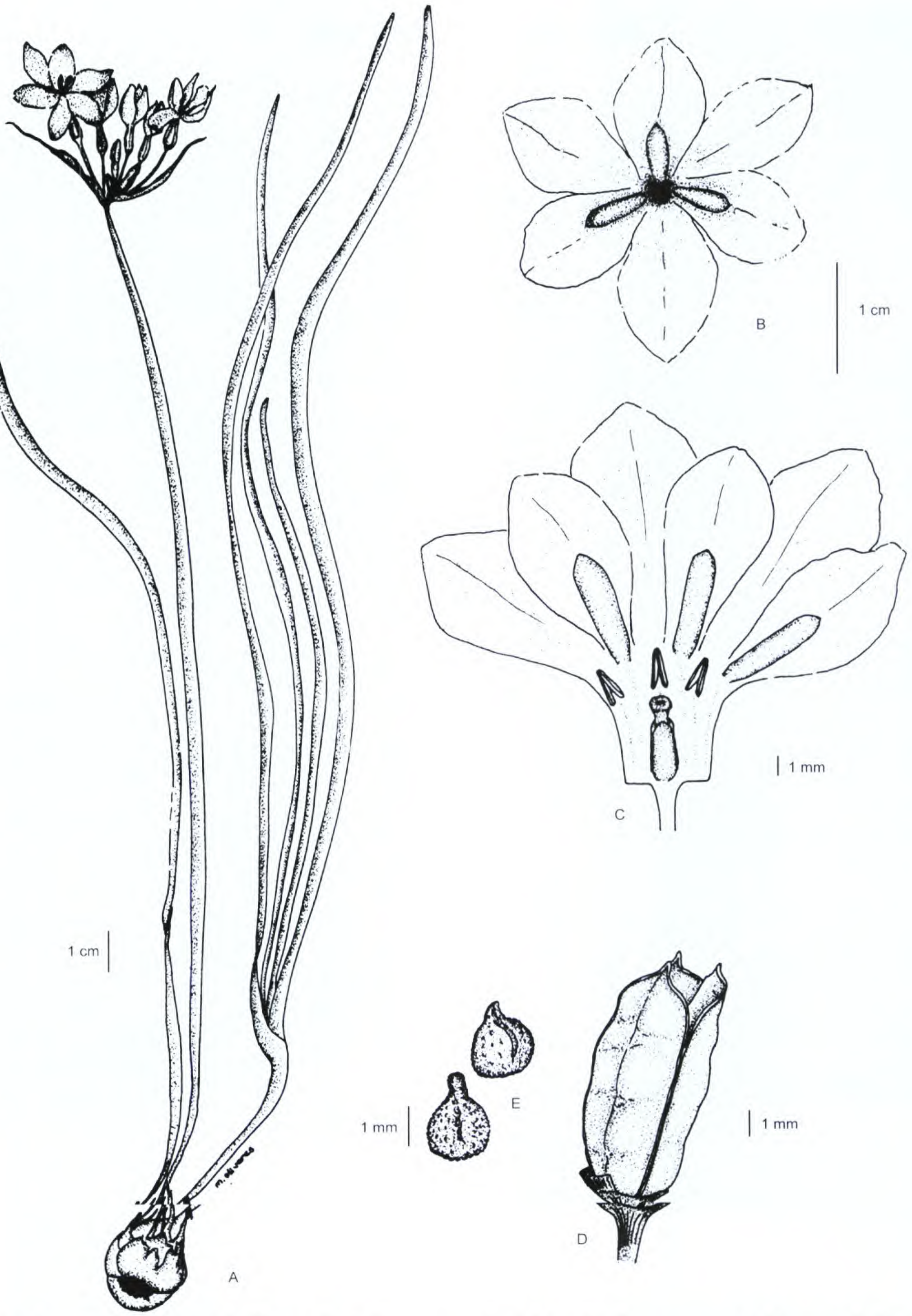

Figure 1. *Leucocoryne talinensis* L. Mansur & M. Cisternas. —A. Habit and inflorescence. —B. Flower. —C. Opened flower showing the stamens. —D. Capsule. —E. Seeds. Drawn from fresh material.

as well as grazing, especially by goats. Its conservation status may be considered vulnerable.

Etymology. The specific epithet refers to the geographic origin of the new species.

Leucocoryne talinensis presents phenotypic characteristics that are stable in regard to the color of its flowers and the cataphylls of the bulb. However, it is frequently possible to find individuals within

Talinay populations that vary in the form of the tepals, some having entire to erose tepals. This plant was referred to previously as *Leucocoryne* sp., "Talinay" (Araneda et al., 2004; Mansur et al., 2004), and as L. sp ecotipo Talinay (de la Cuadra & Mansur, 2004). Its diploid chromosome number was determined to be $2n = 18$, with an idiogramatic formula of 14 metacentric + 2 sub-telocentric + 2 telocentric (Araneda et al., 2004).

The new species is somewhat similar to *Leucocoryne odorata* Lindley. However, unlike *L. talinensis*, *L. odorata* has a chromosome count of $2n = 10$ (Crosa, 1988), filiform staminodes, an inflorescence with only 2 to 4 flowers, and tepals ovate with an acute apex. Its bulb is covered with brownish cataphylls versus grayish white in *L. talinensis*. Further, *L. odorata* is distributed south of 32°S in Chile, whereas *L. talinensis* is found only in the type locality in Talinay at 30°49′S.

Paratype. CHILE. **Coquimbo:** Limarí, Fray Jorge, 450 m, Sep. 1972, *E. Navas 132389* (CONC).

Acknowledgments. The authors are grateful to Rosa Guaglianone and Roberto Kiesling, Instituto de Botanica Darwinion, Argentina, for valuable comments and suggestions on the manuscript, and to Roberto Rodríguez, Departamento de Botánica, Universidad de Concepción, for providing herbarium material. We also thank Ms. Marlen Olivares for drawing the figures of *Leucocoryne talinensis* and Mr. Luis Arriagada for assistance in the collection of specimens.

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Nuevas Especies de *Weinmannia* (Cunoniaceae) para Costa Rica y Colombia

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RESUMEN. Se describen *Weinmannia cogolloi* y *W. vulcanicola* (Cunoniaceae), dos nuevas especies de Colombia y Costa Rica respectivamente. *Weinmannia cogolloi* es un taxón bastante singular dentro del género, por la presencia de inflorescencias paniculadas con ejes secundarios evidentes; aunque se encuentra algo relacionada con *W. latifolia* C. Presl y *W. macrophylla* Kunth, estas últimas se separan por sus inflorescencias racemosas. *Weinmannia vulcanicola* se encuentra relacionada con *W. trianaea* Weddell, de la que se separa por sus hojas con mayor número de folíolos, con la lámina más pequeña y el raquis alado, así como por el conspicuo indumento de sus ramitas jóvenes.

ABSTRACT. *Weinmannia cogolloi* and *W. vulcanicola* (Cunoniaceae), two new species from Colombia and Costa Rica, respectively, are described. *Weinmannia cogolloi* is distinct within the genus on account of its paniculate inflorescences, with conspicuous secondary axes; it is somewhat related to *W. latifolia* C. Presl and *W. macrophylla* Kunth, but these species are easily separated by their racemose inflorescences. *Weinmannia vulcanicola* is somewhat related to *W. trianaea* Weddell, but it is distinguished by its leaves with more and smaller leaflets, winged rachis, and the indument of the young stems.

Key words: Colombia, Costa Rica, Cunoniaceae, Rosales, *Weinmannia*.

Weinmannia L. (Cunoniaceae) es un género pantropical con cerca de 150 especies, mayormente distribuidas en el hemisferio sur (Bernardi, 1961, 1963; Bradford, 1998; Stein, 2001). En forma general, este género se distingue fácilmente por sus hojas opuestas, simples a pinnadamente compuestas, con estípulas foliáceas y conspicuas, inflorescencias racemosas, con las flores dispuestas en fascículos o subfascículos (en el neotrópico) y frutos capsulares. Las últimas revisiones de las especies neotropicales fueron hechas por Bernardi (1961, 1963). Sin embargo, la utilidad de estas monografías es relativamente baja, sobre todo por la carencia de descripciones morfológicas completas y paralelas, así como la ausencia de una lista completa de especímenes examinados. Por otro lado, varias secciones que él propuso fueron problemáticas, dado que algunas fueron inválidamente publicadas por la no designación de un tipo (e.g., sect. *Simplicifoliae*) o que no han sido apoyadas por análisis cladísticos recientes (e.g., Bradford, 1998, 2002). Por lo tanto, a través de este trabajo se siguen los resultados de Bradford (1998, 2002) que incluyen a la sección *Simplicifoliae* (sensu Bernardi, 1963), dentro de la sección *Weinmannia*. Más recientemente, Harling (1999) realizó el tratamiento de Cunoniaceae para la *Flora of Ecuador*, trabajo de relativa alta importancia, por el hecho de proveer descripciones extensas, citación de especímenes examinados e ilustraciones de todos los taxones, así como por clarificar en parte, la confusión taxonómica presente en el género. Durante el proceso de elaboración de las Cunoniaceae para la *Flora Mesoamericana* y el *Manual de las Plantas de Costa Rica*, dos nuevas especies fueron encontradas. Una de ellas con hojas simples, es conocida solo del Departamento de Antioquia, Colombia, siendo bastante notable dentro del género por sus inflorescencias conspicuamente paniculadas, con los ramos laterales secundarios conspicuos, mientras que la segunda, con hojas pinnadas, ha sido conocida por numerosas colecciones desde hace más de 40 años en Costa Rica como *Weinmannia trianaea* Weddell, una especie que de otro modo es restringida al SE de Colombia y Ecuador. Por lo tanto, ambas son descritas a continuación.

Weinmannia cogolloi J. F. Morales, sp. nov. TIPO: Colombia. Antioquia: Par. Nac. Nat. Las Orquídeas, sector Cruces, margen derecha del Río Calles, camino de Cruces hacia Venados, 23 Feb. 1989 (fl), *A. Cogollo, D. Cárdenas & E. Álvarez 4196* (holotipo, JAUM; isotipo, MO). Figura 1.

Haec species *Weinmanniae latifoliae* affinis sed foliis majoribus et inflorescentiis paniculatis differt. *W. macrophyllae* affinis sed foliis coriaceis, supra glabris et inflorescentiis paniculatis differt.

Figura 1. Fotografía, ramita florífera de *Weinmannia cogolloi* J. F. Morales (*A. Cogollo, D. Cárdenas & E. Álvarez 4196*, MO).

Árboles 10–18 m, los tallos conspicuamente angulados y aplanados en tallos jóvenes, subteretes con la edad, densamente tomentosos o tomentulosos, el indumento café. Hojas simples, la lámina 12–20 × 0.5–14 cm, anchamente elíptica, cartácea, agudas y mucronadas apicalmente, anchamente agudas basalmente, serradas marginalmente, esparcidamente puberulentas adaxialmente, densamente puberulentas abaxialmente, no revolutas marginalmente, pecíolos 19–22 mm, tomentosos; estípulas 10–12 mm, anchamente ovadas, conspicuamente cordadas basalmente, caducas. Inflorescencias panículas pareadas, conspicuamente ramificadas, 9–17 cm de longitud, los ejes laterales de

1–3.1 cm de largo, el raquis esparcidamente hirsuto, el indumento amarillento, diminuto, ca. 0.5 mm de largo. Flores ca. 1.5 mm de longitud, los pedicelos 1.5–2.5 mm de largo; lóbulos del cáliz 0.6–0.8 mm de largo, cortamente acuminados apicalmente, glabrescentes; pétalos ca. 1.5 mm de largo; ovario 1.5–2 mm de largo, glabro. Frutos inmaduros ca. 4 mm, glabros.

Distribución, ecología y hábitat. Endémica al noroeste del Departamento de Antioquia, Colombia, donde crece en bosques muy húmedos entre los 800 y 1400 m. Flores y frutos inmaduros han sido recolectados entre febrero y marzo.

Weinmannia cogolloi se encuentra relacionada con *W. latifolia* C. Presl y *W. macrophylla* Kunth, compartiendo caracteres tales como hojas simples, con láminas grandes y desarrolladas, así como inflorescencias usualmente pareadas. Sin embargo, *W. cogolloi* se separa fácilmente de ambas por sus inflorescencias paniculadas, con conspicuas ramas laterales (vs. inflorescencias racemosas, sin ramificaciones). Además, *W. latifolia* tiene hojas con las láminas mucho más pequeñas ((5–)6–8(–11) cm vs. 12–20 cm) y *W. macrophylla* tiene láminas foliares coriáceas y usualmente glabras abaxialmente (vs. láminas cartáceas y puberulentas en *W. cogolloi*), con las márgenes muy esparcidamente crenado-serradas (vs. conspicua y densamente serradas).

Es importante hacer notar que la presencia de inflorescencias paniculadas dentro del género, con ramificaciones o ejes secundarios conspicuos es algo inusual, ya que en forma general, prácticamente todas las especies tienen inflorescencias racemosas. Bradford (1998) realizó un análisis detallado de la arquitectura de la inflorescencia en el género, determinando que debido a la incapacidad de aplicar en forma satisfactoria algunas de las terminologías de tipos de inflorescencia anteriormente propuestos (e.g., Briggs & Johnson, 1979; Weberling, 1989), las inflorescencias en *Weinmannia* debían catalogarse como racimos, aunque si bien, varios tipos de variaciones podían estar presentes. De esta forma, la descripción de *Weinmannia cogolloi*, con inflorescencias claramente paniculadas, es algo bastante raro dentro del género y que sale fuera de contexto de la clasificación propuesta por Bradford (1998).

El epíteto de esta especie está dedicado a Álvaro Cogollo, director del Herbario Joaquín Antonio Uribe (JAUM), Medellín, Colombia, en reconocimiento a su trabajo en pro de la *Flora de Colombia* y por agradecimiento a su apoyo personal y facilidades brindadas en mis visitas a Medellín en los años 2001, 2002 y 2003.

Paratipos. COLOMBIA. **Antioquia:** Urrao, Par. Nac. Nat. Las Orquídeas, sect. Cabaña de Calles, Quebrada La Agudelo, 31 Mar. 1992, *D. Cárdenas & E. Álvarez 3173* (JAUM); Río Calles, 6 Dic. 1993, *A. Cogollo et al. 7862* (INB, JAUM, MO); sect. Calles, Quebrada La Agudelo, 5 Jul. 1991, *E. Ramírez 4134* (JAUM), 8 Jul. 1991, *E. Ramírez 4307* (JAUM).

Weinmannia vulcanicola J. F. Morales, sp. nov. TIPO: Costa Rica. Alajuela: Grecia, Par. Nac. Volcán Poás, sendero a La Laguna Botos, 28 Sep. 1999 (fl), *J. F. Morales 7183* (holotipo, INB; isotipos, K, MO). Figura 2.

Haec species *Weinmanniae trianaeae* affinis sed rhachidibus alatis et foliolis minoribus differt. *W. polyphyllae* affinis sed rhachidibus angustioribus, inflorescentiis agglomeratis et bracteis florigeris minoribus differt.

Arbustos 2–8 m, los tallos conspicuamente angulados y aplanados en tallos jóvenes, subteretes con la edad, densamente tomentosos o tomentulosos, el indumento ferrugíneo a marrón ferrugíneo, algo glabrescentes con la edad. Hojas compuestas, lámina de los folíolos (0.6)0.8–1.5 × 0.3–0.8 cm, elíptica, los folíolos (11)15 a 25(29), subcoriáceos, la mayoría obtusos a redondeados apicalmente, más raramente agudos, obtusos a redondeados basalmente, crenado-serrados, usualmente glabros, sólo con pelos a lo largo del nervio central abaxialmente, variadamente cóncavos y revolutos marginalmente, entrenudos del raquis alados 1.5–2.5(3) mm de ancho, el raquis densamente tomentoso o tomentuloso abaxialmente, el indumento ferrugíneo a marrón ferrugíneo; pecíolos 4–6 mm, densamente tomentosos, usualmente no alados; estípulas 6–7 × 8–9 mm, anchamente ovadas. Inflorescencias racemosas, usualmente pareadas, 6–12 cm de longitud, el raquis y los pedicelos esparcidamente puberulentos, el indumento ferrugíneo o marrón-ferrugíneo, diminuto. Flores 2.5–3 mm de longitud, los pedicelos 2–4 mm de largo; lóbulos del cáliz 0.7–1 mm de largo, cortamente acuminados apicalmente, glabros o glabrescentes; pétalos ca. 2 mm de largo; ovario 1.5–2 mm de largo, glabro. Frutos 4–5 mm, glabros.

Distribución, ecología y hábitat. Esta especie está restringida por el momento a Costa Rica, donde crece en bosques nubosos, áreas de sucesión volcánica, robledales y vegetación secundaria relacionada, entre 2300 y 3000 m. Es probable que este taxón se encuentre en el norte de Panamá, específicamente en las estribaciones de la Cordillera de Talamanca. Especímenes con flores han sido recolectados entre febrero y octubre. Especímenes con frutos se recolectaron entre agosto y diciembre.

Paratipos. COSTA RICA. **Alajuela:** Volcán Poás, 11

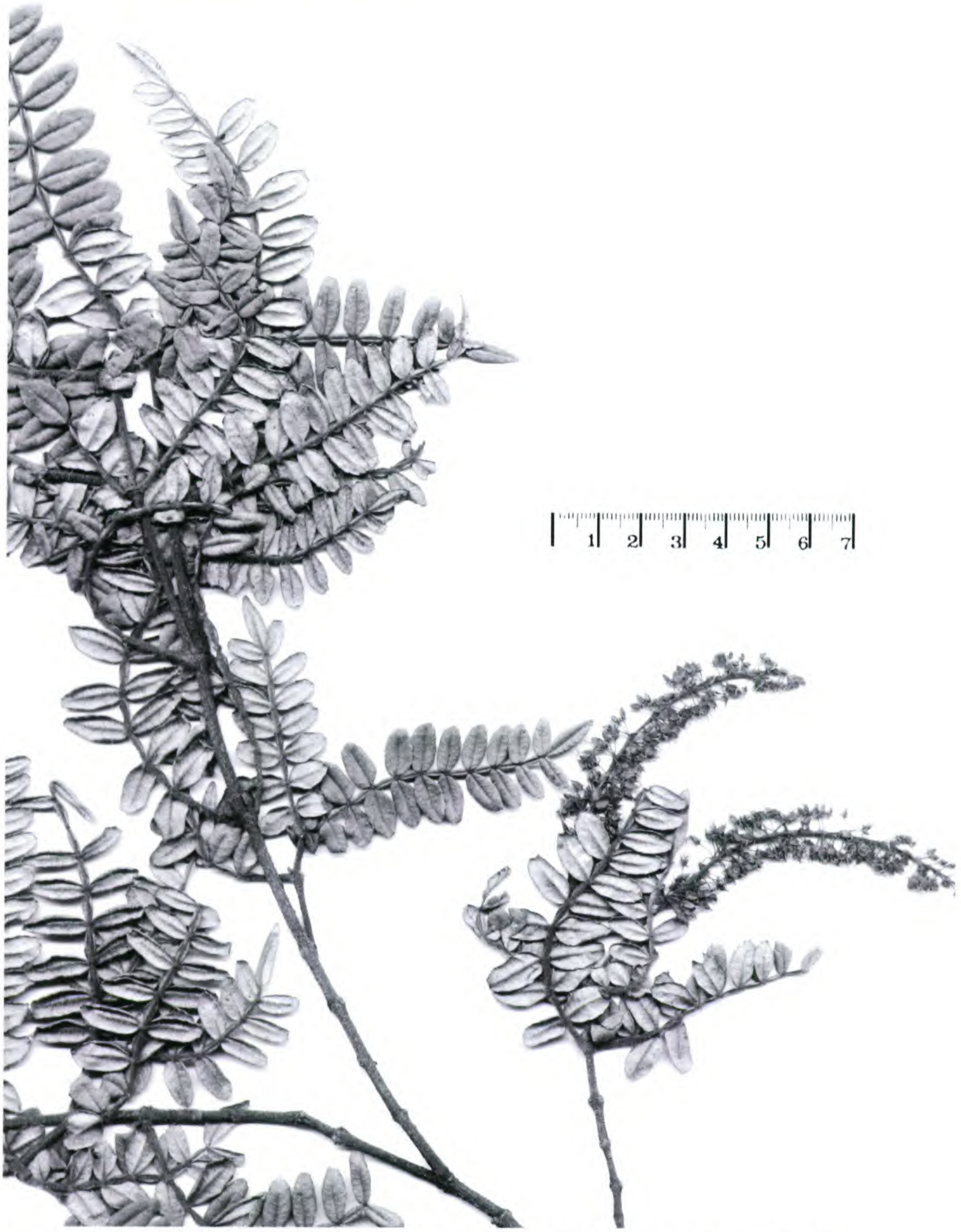

Figura 2. Fotografía, ramita florífera de *Weinmannia vulcanicola* J. F. Morales (*J. F. Morales 7183*, INB).

Sep. 1965, *L. Bernardi 10535* (F, G, MO), 21 Abr. 1968, *C. Córdoba 918* (CR), 5 Mayo 1991, *P. Döbbeler & G. Dauphin 5488* (CR), 3 Mar. 1999, *M. Gargiullo 815* (CR), 18 Mayo 1965, *W. Hatheway 1339* (CR), 19 Ago. 1961, *A. Jiménez 193* (CR, F), 25 Oct. 1964, *E. Little & G. Budowski 20020* (CR), 20 Ago. 1965, *T. McDaniel 6718* (MO), 11 Nov. 1967, *C. Orozco 13* (CR), 18 Jun. 1971, *G. Proctor 32468* (F, MO), 19 Jul. 1976, *J. Solomon 5320* (MO), 13 Jul. 1962, *G. Webster, K. Miller & L. Miller 12280* (F, MO), 1 Sep. 1968, *R. Wilbur & D. Stone 10650* (DUKE, F, MO); Monteverde, 30 Nov. 1976, *V. Dryer 1046* (F); Fila Volcán Viejo, San Carlos, Feb. 1986, *J. Gómez-L. 11032* (CR, F, USJ); O de Vara Blanca, 21 Ene. 1968, *R. Wilbur & D. Stone 9837* (DUKE, F, MO). **Heredia:**

Vara Blanca, 31 Dic. 1973, *F. Almeda, M. Flowers & R. Wyatt 2206* (DUKE, F); Par. Nac. Braulio Carrillo, Volcán Barva, 13 Ago. 1993, *B. Boyle, J. Bradford & K. Sparks 2360* (MO), 14 Ago. 1993, *B. Boyle, A. Boyle, J. Bradford & K. Sparks 2382* (CR, MO); entre Sacramento y Laguna de Barva, Volcán Barva, 12 Abr. 1975, *J. Utley & K. Utley 2027* (F). **Limón:** Talamanca, Sabanas de Dúrika, Río Kuk, 1 km aguas debajo de la confluencia de los Ríos Uk y Kuk, 20 Oct. 1989, *A. Chacón 584* (CR, F, INB, MO); Cordillera de Talamanca, Cerros Tararia, 10 Sep. 1984, *G. Davidse, G. Herrera & M. Grayum 28848* (INB, MO); Par. Int. La Amistad, Cerros Tararia, Valle del Silencio, 1 Abr. 1997, *F. Quesada et al. 1924* (INB).

Weinmannia vulcanicola ha sido tradicionalmente conocida en Costa Rica como *W. trianaea*, pero el análisis de las poblaciones del sur de Colombia y Ecuador con respecto a las de Costa Rica, así como el estudio del ejemplar tipo de *W. trianaea* (*Triana s.n.*, BM, K, P, W) determinó que el grupo presente en este último país tiene suficientes caracteres distintivos, como para ser tratada como un taxón aparte. *Weinmannia vulcanicola* difiere de *W. trianaea* por sus hojas con el raquis alado a lo largo de su extensión (vs. alado sólo en el tercio distal) y con muchos más folíolos ((11)15 a 25(29) vs. (9)11–17(20)), estos últimos con la lámina mucho más pequeña y angosta ((6)8–15 × 3–8 mm vs. (17–)22–30 × (7–)9–14 mm) y la presencia de un indumento ferrugíneo o café-ferrugíneo en los tallos jóvenes. *Weinmannia vulcanicola* se encuentra relacionada con *W. polyphylla* Moricand ex Seringe, otra especie restringida al noroeste de Sur América con quien comparte hojas con similar número y dimensión de folíolos; sin embargo, *W. vulcanicola* difiere por sus hojas con las alas del raquis más angostas, inflorescencias densamente aglomeradas (vs. laxas), y fascículos con las brácteas lineares y rápidamente deciduas, ca. 1 × 0.5 mm (vs. brácteas persistentes anchamente ovadas o elípticas, 1.5–2 × 1–1.5 mm).

Estas tres especies pueden ser separadas por la siguiente clave:

Clave para las Especies Relacionadas con *Weinmannia vulcanicola* en Costa Rica, Colombia y Ecuador

1a. Raquis de las hojas no alado o solamente alado en el tercio terminal; lámina de los folíolos laterales (17)22–30 × (7)9–14 mm . . . . *W. trianaea*

1b. Raquis de las hojas alado en toda su extensión; lámina de los folíolos laterales (6)8–15 × 3–8 mm.

2a. Tallos jóvenes esparcidamente hirsútulos, glabrescentes con la edad, el indumento amarillento, no ferrugíneo; inflorescencias con los fascículos laxamente distribuidos; brácteas persistentes aún en fructificación, anchamente ovadas o elípticas, 1.5–2 × 1–1.5 mm; S de Colombia y Ecuador . . . . . *W. polyphylla*

2b. Tallos jóvenes tomentosos o tomentulosos, nunca glabrescentes, el indumento ferrugíneo o café-ferrugíneo; inflorescencias con los fascículos densamente aglomerados; brácteas rápidamente deciduas, lineares, ca. 1 × 0.5 mm; Costa Rica . . . . . *W. vulcanicola*

Agradecimientos. Quiero agradecer a los curadores y personal de los herbarios CR, DUKE, F, G, HUA, JAUM, MO, NY, MEDEL, US, USJ, por permitirme el uso de sus colecciones, así como el personal del Herbario de la Universidad de Antioquia (HUA) y del Jardín Botánico Joaquín Antonio Uribe (JAUM), por las facilidades logísticas ofrecidas en mis visitas a Medellín, Colombia. Finalmente, se agradece la revisión crítica del manuscrito por parte de un revisor anónimo y de Jason Bradford; este último suministró además referencias bibliográficas e importantes comentarios sobre la clasificación seccional en *Weinmannia*.

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Una Nueva Especie de *Werauhia* (Bromeliaceae) para Costa Rica

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RESUMEN. Se describe e ilustra *Werauhia anitana* (Bromeliaceae), una nueva especie de Costa Rica, con inflorescencias dísticas y brácteas punteado-verrucosas, densamente imbricadas aún después de la antesis. Se discuten las relaciones con los taxones relacionados (i.e., *W. osaensis*, *W. viridiflora*).

ABSTRACT. *Werauhia anitana* (Bromeliaceae), a new species from Costa Rica with distichous inflorescences, and punctate-verrucose and densely imbricate bracts (after anthesis), is described and illustrated. Relationships with related taxa (i.e., *W. osaensis*, *W. viridiflora*) are given.

Key words: Bromeliaceae, Central America, Costa Rica, Neotropics, *Werauhia*.

Las Bromeliaceae están representadas en Costa Rica por aproximadamente 210 especies y 16 géneros (Morales, 2003c). El género *Werauhia*, segregado de *Vriesea* por Grant (1995), es el más numeroso con cerca de 80 especies, muchas de ellas restringidas a Costa Rica y Panamá. Un intensivo trabajo de campo en los últimos 15 años, llevado a cabo principalmente por el Instituto Nacional de Biodiversidad (INB) e investigadores asociados del Missouri Botanical Garden (MO) y del Museo Nacional de Costa Rica (CR), ha incrementado en forma significativa el número de especies de bromelias conocidas en forma previa para el país, con la subsecuente descripción de varias novedades (Grant & Morales, 1996; Luther & Kress, 1996; Morales, 1999; Spencer & Smith, 1991). Cuando la exploración botánica de Costa Rica empezó a finales del siglo IXX y principios del siglo XX, la región del área del Paso de la Palma, localizada al norte de San José entre los volcanes Irazú y Barba, fue una de las localidades más colectadas, sobre todo por su facilidad de acceso desde San José y la presencia de extensas zonas boscosas. Muchas Bromeliaceae fueron colectadas por Carlos Wercklé de esta área, especialmente rica en bromelias y epífitas en general (e.g., Ericaceae, Orchidaceae) y algunas de ellas aún son conocidas por muy pocas colecciones (e.g., *W. singuliflora* (Mez & Wercklé) J. R. Grant).

Durante varios viajes de campo a esta área entre 1999 y 2003, con el objetivo de estudiar y localizar algunas de estas especies de bromelias pobremente conocidas, una nueva especie de *Werauhia* sect. *Werauhia* fue encontrada, no colectada previamente por Wercklé. En forma general, las especies de *Werauhia* de Costa Rica pertenecientes a esta sección y envueltas en el complejo de *W. gladioliflora* y *W. viridiflora* (e.g., *W. acuminata* (Mez & Wercklé) J. R. Grant, *W. bicolor* (L. B. Smith) J. R. Grant) son numerosas y su taxonomía ha sido poco estudiada, pues las colecciones disponibles son en muchos casos muy escasas y fragmentarias. El estudio extensivo de las poblaciones en las localidades de los tipos en los últimos años ha llevado al reconocimiento de especies no aceptadas por Grant (1995), ya que presentaban caracteres bien distintivos (e.g., forma y textura de las brácteas, preferencias ecológicas y altitudinales) que no habían sido estudiados previamente en detalle (Morales, 2003b).

Esta nueva especie muestra cercanas afinidades con *Werauhia osaensis* (J. F. Morales) J. F. Morales y *W. viridiflora* (Regel) J. R. Grant, ya que este grupo de especies comparten inflorescencias simples, no ramificadas, con brácteas florales de longitudes similares. Por lo tanto, es descrita a continuación y se discuten las relaciones con estas especies.

Werauhia anitana J. F. Morales, sp. nov. TIPO: Costa Rica. San José: Paso de la Palma, camino a Bajo La Hondura, cerca de las lecherías en ruinas, 1300–1400b m, 2 Nov. 2002 (fl), *J. F. Morales & R. Abarca 9074* (holotipo, INB). Figura 1.

A *Werauhia osaensi*, cui similis, foliis angustioribus, scapo decurvato, et bracteis florigeris punctatis verrucosis differt; a *W. viridiflora*, cui affinis, bracteis florigeris imbricatis punctatis verrucosis et petalis majoribus differt.

Plantas acaulescentes, con una altura en floración de 30 a 40 cm. Hojas rosuladas, ± erectas pero algo reflexas apicalmente, 11–38 cm de longitud, densa a moderadamente punteado-lepidotas, con las puntuaciones negras, en especial abaxialmente, delgadas, verdes, verde-moradas o total-

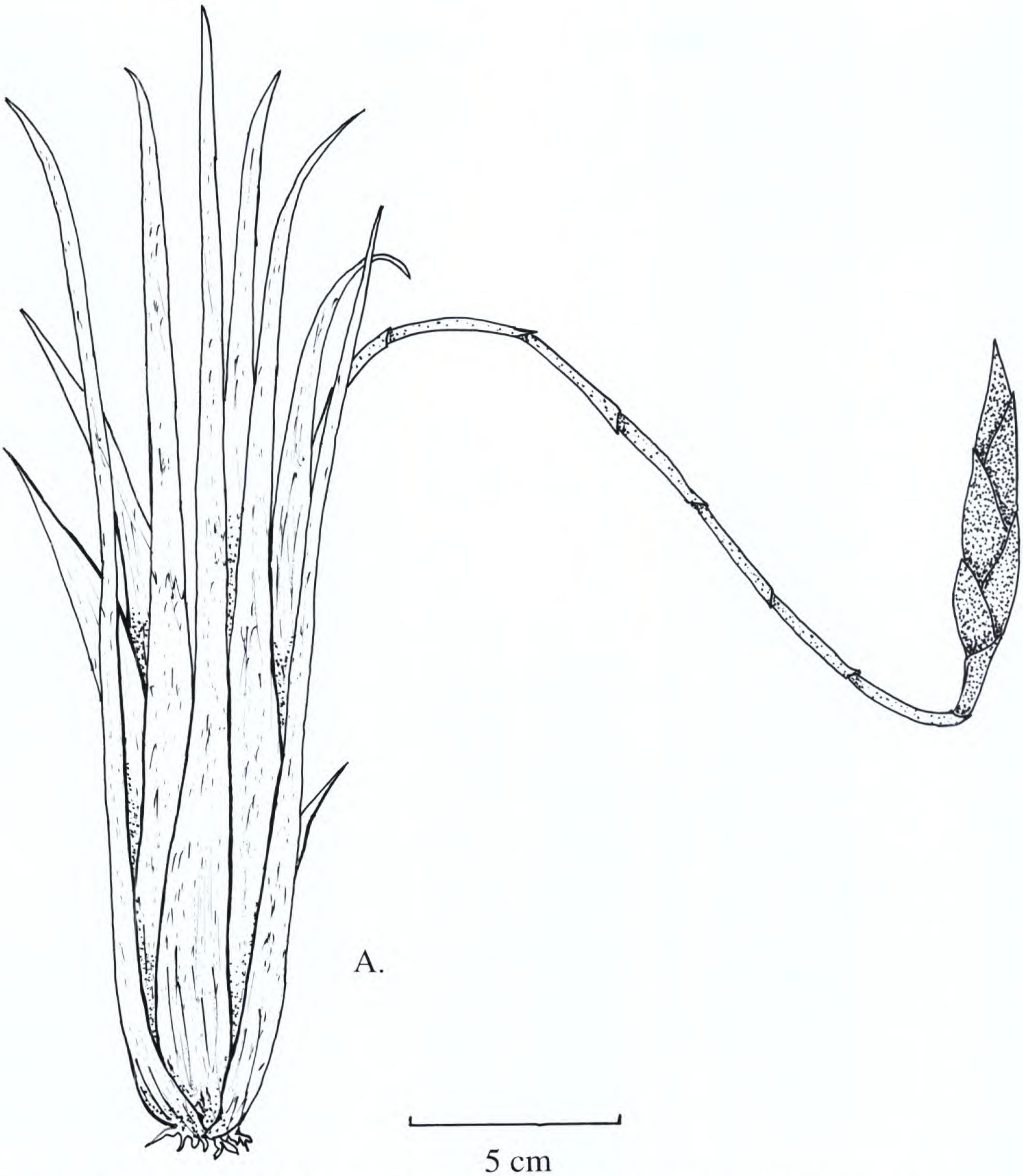

Figura 1. *Werauhia anitana* J. F. Morales (*Morales & Abarca 9074*, INB). —A. Hábito e inflorescencia.

mente moradas por ambas superficies; base de la lámina anchamente elíptica, (4)9–11 × (2.2)3 cm, pálida, usualmente concolora con las láminas, densamente negro punteado lepidota, en especial abaxialmente; lámina de las hojas ligulada, atenuada o aguda, 7–27 × 1–1.3 cm. Escapo decurvado, 38–41 × 0.3–0.4 cm, glabro, diminutamente café papilado; brácteas del escapo erectas, 2.5–3.5 cm de longitud, mucho más largas que los entrenudos, densamente imbricadas, café oscuras basalmente, algo más claras distalmente, densamente punteado-verrucosas. Inflorescencias erectas, simples, 11–13 cm de longitud; brácteas florales anchamente ovadas, agudas, 4.1–4.5 × 2.2–2.5 cm, relativamente delgadas, densamente imbricadas y conspicuamente excediendo los sépalos, de color café canela en la antesis, los bordes ligeramente más claros, ecarinadas, conspicuamente punteado-verrucosas. Flores 5 a 6, con los pedicelos gruesos, 2–5 mm de longitud, erectos, esparcidamente papilados; sé-

palos 1.5–1.7 cm de longitud, erectos, angostamente obovados a obovado-elípticos, coriáceos, café claros. Corola blanco-crema o crema, los pétalos obovado-elípticos, 35–40 mm de longitud, obtusos, con las dos escamas basales enteras; estigma blanco. Cápsula desconocida.

Distribución y hábitat. *Werauhia anitana* es endémica a Costa Rica, donde se encuentra restringida al Paso La Palma, en bosques montanos nubosos o bosques ventosos premontanos y vegetación perturbada asociada en elevaciones entre 1350–1500 m. Floración ocurre en junio y noviembre.

Etimología. Esta especie está nombrada en honor a Anita Cooper, en reconocimiento de su excelente y extensivo trabajo en ilustraciones de acuarela para las guías de campo *Bromelias de Costa Rica* (Morales, 2000) y *Orquídeas, Cactus y Bromelias del Bosque Seco de Costa Rica* (Morales, 2001), que las realizó mientras estuvo en Costa Rica en 1996.

Siguiendo la clasificación infragenérica propuesta por Grant (1995), *Werauhia anitana* debe ser incluida en la sect. *Werauhia*, la que se caracteriza por sus inflorescencias simples o compuestas, pero entonces conspicuamente bipinnadas o tripinnadas. *Werauhia anitana* está cercanamente relacionada con *W. osaensis* (J. F. Morales) J. F. Morales, compartiendo caracteres tales como inflorescencias simples, dísticas, no ramificadas, con las brácteas florales densamente imbricadas. Sin embargo, *W. anitana* es facilmente distinguida por sus hojas con la lámina más angosta (1–1.3 cm), escapo decurvado y brácteas densamente punteado-verrucosas, las cuales son de un café canela en la antesis, en contraposición con *W. osaensis*, que tiene hojas con la lámina más ancha ((1.4–)2.5–3.8 cm), escapo erecto y brácteas verdes o verde-canela en la antesis, lisas a levemente rugulosas. Además, ambas especies tienen preferencias ecológicas diferentes: mientras *W. anitana* crece en bosques montanos nubosos o bosques ventosos premontanos a elevaciones de 1350–1500 m, *W. osaensis* se encuentra en bosques muy húmedos, entre 0–700 m. *Werauhia osaensis* fue originalmente descrita en el género *Vriesea* (Morales, 1999), pero dado que las flores de esta especie tienen las escamas basales de los pétalos enteras y en forma de lengua, así como una coloración blanca o crema, fue recientemente transferida a *Werauhia* (Morales, 2003a).

Werauhia viridiflora (Regel) J. R. Grant se puede confundir con esta nueva especie, ya que ambas tienen láminas foliares de dimensiones y formas similares, inflorescencias simples, no ramificadas y preferencias ecológicas similares. Sin embargo, la principal diferencia se encuentra en la disposición y textura de las brácteas florales, ya que mientras en *W. viridiflora* estas son levemente imbricadas y usualmente lisas, en *W. anitana* están densamente imbricadas, con la superficie externa punteado-verrucosa. Además, las flores de *W. anitana* tienen pétalos más grandes en relación a *W. viridiflora* (3.5–4 cm vs. 2.4–2.6 cm).

Paratipos. COSTA RICA. **San José:** Paso de la Palma, ruinas de las lecherías, 12 Dic. 2002, *Morales 8919* (INB), 10 Jun. 2003, *Morales & Idárraga 9432* (INB).

Agradecimientos. Quiero agradecer a Michael Grayum por sus comentarios de una versión previa en inglés de algunas partes de este manuscrito. Esta publicación fue financiada por la Asistencia Holandesa para el Desarrollo (NEDA) a través del proyecto "Desarrollo del Conocimiento de la Biodiversidad y Uso Sostenible en Costa Rica" conducido por el Instituto Nacional de Biodiversidad (INBio). Además, la investigación fue posible gracias al convenio de cooperación entre el Ministerio de Ambiente y Energía (MINAE) e INBio con el fin de completar el Inventario Nacional de Biodiversidad en Costa Rica.

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Una Nueva Especie de *Sphyrospermum* (Ericaceae) para Costa Rica

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Resumen. Se describe e ilustra *Sphyrospermum linearifolium* (Ericaceae), un taxón endémico a Costa Rica, bastante singular dentro del género por sus hojas lineares y hábito colgante y se comenta su relación con otras especies dentro del género.

Abstract. *Sphyrospermum linearifolium* (Ericaceae), a new endemic species from Costa Rica, is described and illustrated, and its relationships are discussed. The taxon is distinctive within the genus because of its linear leaves and scandent habit.

Key words: Costa Rica, Ericaceae, *Sphyrospermum*.

El género *Sphyrospermum* Poeppig & Endlicher está representado por cerca de 22 especies, distribuidas desde México a Suramérica y las Islas del Caribe (Luteyn, 1996). Se puede reconocer por su hábito arbustivo, hojas con la venación usualmente inconspicua, flores con el pedicelo no articulado al hipanto, el pedicelo en la mayoría de los casos relativamente largo y filiforme, con dos bractéolas, hipanto terete, corola cortamente tubular (generalmente menos de 10 mm de longitud), estambres de similar tamaño entre sí, anteras dehiscentes a través de aberturas ovaladas e introrsas, ovario ínfero y frutos abayados (Luteyn, 1991). En Costa Rica, algunas especies pueden llegar a ser muy comunes en ciertas áreas, sobre todo en márgenes y paredones alterados de caminos y carreteras. En estas condiciones llegan a ser bastante dominantes, junto con otras Ericaceas, tales como *Disterigma humboldtii* (Klotzsch) Niedenzu y *Gaultheria erecta* Ventenat.

En el próximo tratamiento del género *Sphyrospermum* para el país (Luteyn et al., en prep., *Manual de Plantas de Costa Rica*), se reconocen cinco especies, una de ellas endémica y restringida a las Cordilleras de Tilarán y Talamanca. La exploración de ciertas zonas remotas e inexploradas en la vertiente Atlántica del Volcán Turrialba (Cordillera Central), produjo como resultado el hallazgo de una notable especie de *Sphyrospermum*. Esta planta se caracteriza por su hábito colgante y hojas estrictamente lineares, este último carácter no reportado dentro del género hasta el momento, lo cual de cualquier manera, no es algo común en otros géneros de la familia (e.g., *Anthopterus* Hooker, *Cavendishia* Lindley).

Por lo tanto, se brinda una clave para todas las especies del género en Costa Rica, así como la descripción de este nuevo taxón.

Clave para las Especies de *Sphyrospermum* en Costa Rica

1a. Hojas con la lámina linear . . . . . *S. linearifolium* Al. Rodríguez & J. F. Morales
1b. Hojas con la lámina de diversas formas, pero nunca linear.
2a. Pedicelos 1–3 mm; corola rojiza a rojizo-rosada, 7–10 mm de longitud, campanulada . . . . . *S. dissimile* (S. F. Blake) Luteyn
2b. Pedicelos 5–25 mm; corola blanca a blanco-rosada, 2–9 mm de longitud, urceolado-cilíndrica, subcilíndrica a cilíndrica.
3a. Flores extendiéndose más allá de las hojas *S. buxifolium* Poeppig & Endlicher
3b. Flores no extendiéndose más allá de las hojas.
4a. Corola (4–)5–7(–9) mm; pedicelos 15–25 mm . . . *S. cordifolium* Bentham
4b. Corola 2–3.5 mm; pedicelos 7–15 mm.
5a. Lámina foliar 1.5–4 cm de largo; corola 3–3.5 mm; zonas bajas en la Península de Osa en el Pacífico Sur, 100–500 m . . . . . *S. ellipticum* Sleumer
5b. Lámina foliar 4.5–6 cm de largo; corola 2–2.3 mm; elevaciones medias en las cordilleras de Guanacaste, Tilarán y Talamanca, 850–1500 m . . . . . *S. standleyi* A. C. Smith

Sphyrospermum linearifolium Al. Rodríguez & J. F. Morales, sp. nov. TIPO: Costa Rica. Limón: Altos de Pascua, cabeceras Quebrada Linda, 1 Abr. 2001 (fl, fr), *J. F. Morales 7823* (holotipo, INB; isotipos, CR, K, NY, MO). Figura 1.

Ab aliis speciebus *Sphyrospermi* foliis linearibus distinguitur.

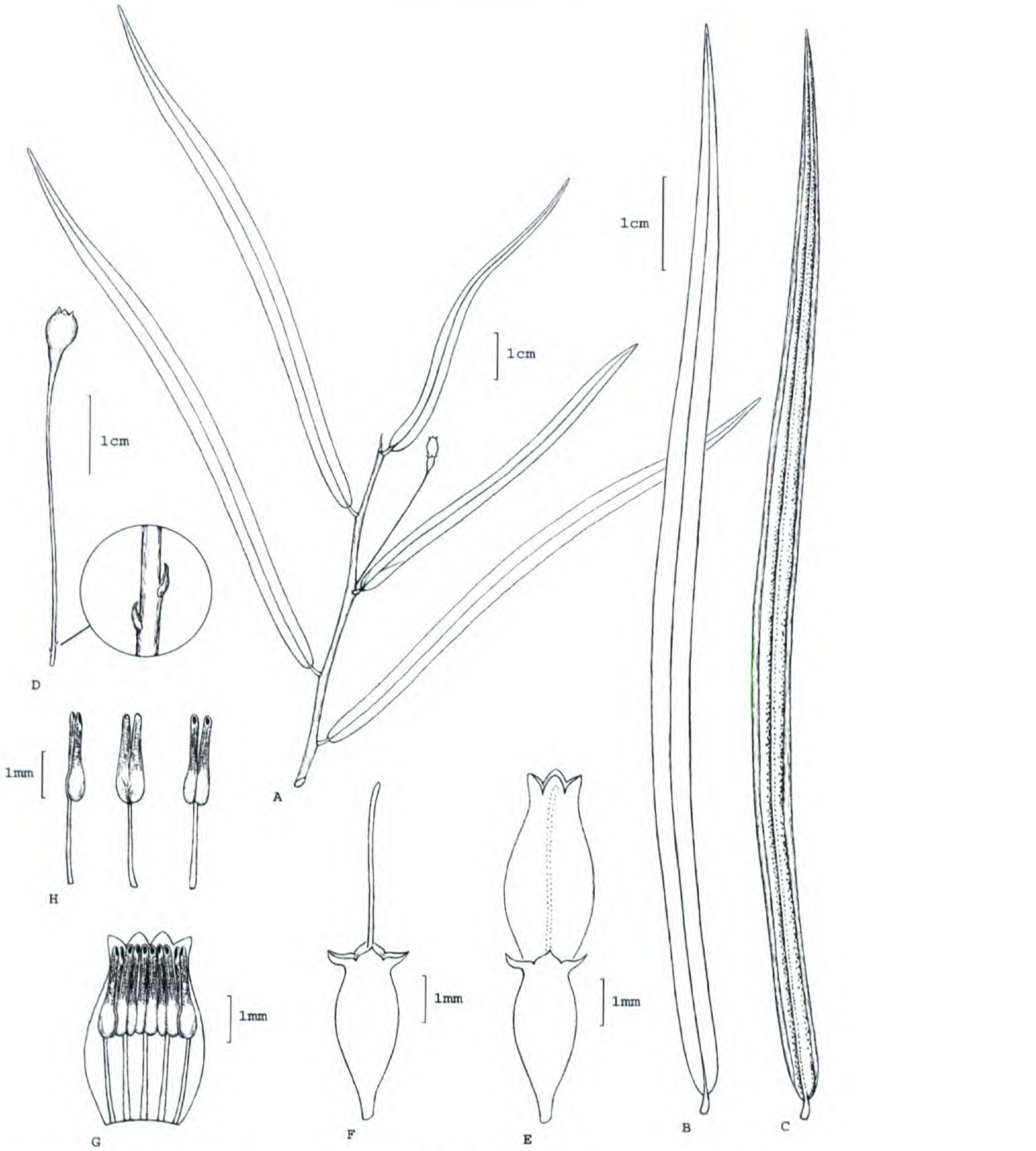

Figura 1. *Sphyrospermum linearifolium* Al. Rodríguez & J. F. Morales (*J. F. Morales 7823*, holotipo). —A. Hábito. —B. Lámina de la hoja, vista adaxial. —C. Lámina de la hoja, vista abaxial. —D. Cáliz y pedicelo, mostrando el detalle de las bractéolas. —E. Cáliz y corola. —F. Cáliz, con la corola removida. —G. Corola abierta, mostrando la posición de las anteras. —H. Anteras, vista lateral, dorsal y ventral, mostrando las aperturas de los túbulos.

Plantas epífitas y colgantes; ramas delgadas, glabrescentes, longitudinalmente estriadas; ramitas de coloración canela a canela-grisácea, diminuta y esparcidamente puberulentas. Pecíolos 1–2 mm de largo; hojas alternas, la lámina linear, 3.5–14.4 × 0.2–0.8 cm, el ápice angostamente agudo, la base angostamente obtusa, el margen entero, usualmente revoluto en las hojas viejas, coriáceas a subcoriáceas, glabrescentes adaxialmente, la vena central muy esparcidamente pilósula, la lámina diminuta y esparcidamente estrigulosa abaxialmente, inconspicuamente 2–3-plinervadas. Flores axilares, solitarias; pedúnculo delgado, continuo con el hipanto, 1.1–3.3 cm de largo, glabro; brácteas 2, ca. 0.65 mm de largo, lineales, deciduas; hipanto subgloboso, terete a subterete, ca. 1.2 mm en diámetro, glabro; limbo del cáliz suberecto, 0.75–1 mm (incluyendo los lóbulos) de largo, los lóbulos 4, de 0.2–0.6 mm de largo, deltados, agudos, glabros; corola urceolada, rosada a blanco-rosada, el tubo ca. 5 mm de largo, ca. 3 mm en diámetro, glabro, los lóbulos de la corola triangulares, ca. 0.65 mm de largo, agudos; estambres 5, iguales, levemente más cortos que el tubo de la corola, los filamentos ca. 1.75 mm de largo, glabros a esparcidamente vilosos, las anteras lisas, ca. 2.3 mm de largo, los

túbulos abriéndose por aberturas ovaladas e introrsas; ovario inferior, el estilo filiforme, casi tan largo como la corola, el estigma truncado. Baya globosa a subglobosa, 5–8 mm en diámetro, glabra, blanquecina o morado-blanquecina.

Distribución. Endémica a Costa Rica, donde ha sido reportada de la vertiente Atlántica de la Cordillera Central, en las faldas de los volcanes Barva y Turrialba, entre los 700–1500 m.

Fenología. Especímenes con flores han sido recolectados en marzo y abril. Colecciones con frutos fueron hechas en marzo, abril y julio.

Sphyrospermum linearifolium puede ser reconocida fácilmente dentro del género por sus hojas lineares, usualmente revolutas marginalmente, así como por su hábito colgante. En forma general las demás especies en el país tienen hojas de formas variadas, pero nunca tan angostas para dar una sensación de ser lineares. Asimismo, el hábito colgante es un carácter bastante irregular, ya que es común que el resto de los taxones en el país tengan hábito arbustivo o rastrero.

La vertiente atlántica del Volcán Turrialba, así como muchas zonas aledañas (Bonilla de Turrialba, El Destierro) en las provincias de Cartago y Limón, han sido áreas hasta el presente inexploradas desde el punto de vista botánico. Exploraciones más intensas en un futuro pueden arrojar a la luz otros hallazgos igual de interesantes y novedosos.

Paratipos. COSTA RICA. **Heredia:** Par. Nac. Braulio Carrillo, falda atlántica del volcán Barva, 28 Mar. 2002, *J. F. Morales 9772* (CR, INB, MO). **Limón:** Altos de Pascua, cabeceras Quebrada Linda, 11 Jul. 2003, *J. F. Morales & R. Callejas 9426* (INB, MO).

Agradecimientos. Deseamos agradecer a James Luteyn (NY) por ayudarnos a clarificar en forma previa el status de esta especie, así como a Claudia Aragón por la ilustración. También se agradece la revisión crítica del manuscrito por parte de un revisor anónimo. Esta publicación fue financiada por la Asistencia Holandesa para el Desarrollo (NEDA) a través del proyecto "Desarrollo del Conocimiento de la Biodiversidad y Uso Sostenible en Costa Rica" conducido por el Instituto Nacional de Biodiversidad (INBio). Además, la investigación fue posible gracias al convenio de cooperación entre el Ministerio de Ambiente y Energía (MINAE) e INBio con el fin de completar en Inventario Nacional de Biodiversidad.

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Dos Especies Nuevas del Género *Melica* L. (Poaceae: Meliceae) del Uruguay

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RESUMEN. Se describen e ilustran dos nuevas especies de *Melica* L. (Poaceae: Meliceae), *M. animarum* y *M. serrana*, endémicas de la Sierra de Ánimas (Maldonado, Uruguay). *Melica animarum* y *M. serrana* son afines a *M. hyalina* Döll. *Melica animarum* se diferencia de *M. hyalina* por la gluma inferior elíptica, de ápice dentado y la lema de ápice bidentado de bordes irregulares. *Melica serrana* se diferencia de *M. hyalina* por la gluma inferior obovada, de ápice emarginado e irregular y la lema de ápice irregular eroso.

ABSTRACT. Two new species of *Melica* L. (Poaceae: Meliceae), *M. animarum* and *M. serrana*, endemic to the Sierra de Ánimas (Maldonado, Uruguay), are described and illustrated. *Melica animarum* and *M. serrana* are related to *M. hyalina* Döll. *Melica animarum* is differentiated from *M. hyalina* by the elliptic lower glume, with a dentate apex and lemma with bidentate apex and irregular margins. *Melica serrana* is differentiated from *M. hyalina* Döll by the obovate lower glume, with an emarginated and irregular apex and lemma with an irregular and erose apex.

Key words: *Melica*, Meliceae, Poaceae, Uruguay.

El género *Melica* L. (Poaceae–Meliceae) presenta entre 96 (Hempel, com. pers. 2003) y 80 especies (Clayton & Renvoize, 1989), distribuidas principalmente en las regiones templadas, con excepción del continente australiano. En Uruguay se comportan como especies de ciclo invernal, floreciendo durante la primavera–verano, habitando principalmente en las praderas.

El mayor número de especies en América del Sur, aparece en Argentina, Brasil y Uruguay. En Argentina se encuentran 17 especies (Zuloaga et al., 1994), presentando la mayor diversidad en el centro y este (Torres, 1980). La mayor concentración de especies en Brasil, ocurre en Rio Grande do Sul, con 12 especies (Longhi-Wagner, 1987), disminuyendo en número y expresión en dirección norte. Para Uruguay, son citadas 10 especies por Rosengurtt et al. (1970), distribuidas por todo el país. Para Chile, son referidas 7 especies, distribuidas principalmente en la región central (Muñoz-Schick, 1984).

Durante el levantamiento de la familia Poaceae en la Sierra de Ánimas, en la región Este del Uruguay, se constataron dos especies nuevas de *Melica* para la ciencia, *Melica animarum* y *Melica serrana*, endémicas del lugar.

La Sierra de Ánimas, ubicada en el Departamento de Maldonado, está constituida por una sucesión de cerros redondeados, que se extienden en sentido norte-sur, donde se localiza el Cerro de las Ánimas, lugar de colecta de las especies aquí descriptas. El Cerro de las Ánimas es la máxima elevación de la formación, con una altura de 501 m s.m. Estos cerros se encuentran separados por valles profundos, con las laderas cubiertas por vegetación serrana arbustiva y arbórea, sujetos a una acción constante del viento proveniente del mar. La combinación de una serie de factores, tales como altitud, viento, radiación luminosa, humedad, suelo y vegetación, determinan la ocurrencia de microambientes particulares que propician la existencia de especies endémicas de gramíneas y de otras familias, como la *Mimosa burkartii* descripta por Marchesi (1987).

Melica animarum J. Mujica & M. Marchi, sp. nov. TIPO: Uruguay. Maldonado: ". . . Sierra de Ánimas, Cerro de las Ánimas, ladera Oeste, en la cercanía de la cima", 2 Nov. 1991, *J. Mujica 240* (holotipo, MVFA). Figura 1.

Melicae hyalinae affinis sed gluma inferiore elliptica, apice dentato et lemmate apice bidentado praecipue differt.

Planta perenne, cespitosa, con rizoma horizontal, de 25 cm de altura; cañas erectas, simples, con asperezas retrorsas esparcidas; vainas foliares glabras, retroescabrosas; lígula membranácea, hialina, glabra, dilacerada, desde muy reducida hasta 0.8 mm de long.; láminas foliares lanceoladas, planas, de ápice agudo no punzante, dísticas, de (5–)9–10 × 0.2–0.28 cm, de faz dorsal estriada, faz ventral de nervaduras marcadas y con asperezas antrorsas abundantes, márgenes con pestañas esparcidas. Inflorescencia en panoja lineal, contraída, ± densa, de 7–10 × 1–1.5 cm, de ramas verticiladas, las mayores de 5 cm de long., lisas; raquis con escasas asperezas retrorsas; pedicelos curvos, pilosos. Espiguillas comprimidas lateralmente, violáceas, de 6–7.7 mm de long., con 2, raramente 1 antecio(s) inferior(es) hermafrodita(s) y 1 a 3 neutros terminales reducidos, formando un cuerpo apical; raquilla articulada por debajo de las glumas, estas caducas con el antecio maduro; glumas desiguales en forma y tamaño, papiráceas en la región de los nervios, hialinas en los márgenes y con una amplia zona hialina apical; gluma inferior elíptica, de ápice dentado, dorso liso, violáceo, a veces con débiles y escasas asperezas antrorsas en la mitad superior, glabra, de 6–7.7 × 4–4.8 mm, 7-nervada; gluma superior oblanceolada, de ápice emarginado, de dorso escabriúsculo, glabra, violácea, de nervaduras muy poco notorias, con una amplia zona hialina apical, 5-nervada, de 6–7 × 1.8–2.3 mm. Primer antecio hermafrodita, con lema elíptica, lanceolada, papirácea, de ápice bidentado, de bordes irregulares, de 4.8–6 mm (incluyendo el ápice hialino de 1–1.2 mm de long.) × 1.8–2.4 mm de ancho total, dorso con nervaduras poco engrosadas, escabrosas, con pelos submarginales, hialinos, retorcidos, de hasta 1.2 mm de long.; pálea elíptica, de base estrecha, hialina, de ápice bidenticulado, 2-nervada, nervaduras cilioladas en su mitad o cuarto superior, dorso glabro y liso entre las nervaduras, de 4.8–5 × 1.1–1.2 mm; segundo antecio hermafrodita, similar al basal, pero de menor tamaño y generalmente glabro y con escasos pelos submarginales, a veces neutro y sin pálea; antecios superiores neutros, reducidos a las lemas rudimentarias, incluidas una dentro de otra, constituyendo un cuerpo apical obcónico; estambres 3, con anteras lineales de 1.1–1.2 mm de long.; ovario glabro, con 2 estigmas plumosos. Cariopsis no observado.

Melica animarum es endémica de la Sierra de Ánimas, habiendo sido colectada únicamente en un campo de la ladera oeste, próximo a la cima del Cerro de las Ánimas. El lugar de colecta está aproximadamente a 500 m s.m., presentando un suelo oscuro, rico en materia orgánica, con cobertura pedregosa. En el área referida, la especie es rara, no habiendo sido colectados más ejemplares de la misma, a pesar de que los autores han retornado al Cerro de las Ánimas en diversas ocasiones con tal finalidad.

Melica animarum fue colectada florecida, no fructificada a inicios de noviembre. Esta especie es afín a *Melica hyalina* Döll, esta última también existente en la región, diferenciándose principalmente por la gluma inferior elíptica y de ápice dentado, y por la lema de ápice bidentado de bordes irregulares.

Melica serrana J. Mujica & M. Marchi, sp. nov. TIPO: Uruguay. Maldonado: ". . . Sierra de Ánimas, Cerro de las Ánimas, en borde de bosque", 27 Nov. 1995, *M. Marchi, J. Mujica & R. Brescia 1464* (holotipo, MVFA). Figura 2.

Melicae hyalinae affinis sed gluma inferiore obovata apice emarginato et irregulari, lemmate apice irregulari eroso differt.

Planta perenne, cespitosa, con rizoma horizontal, de 25–65 cm de altura; cañas suberectas, simples, escabras o escabriúsculas; vaina foliar escabriúscula, con pelos cortos adpresos sobre las nervaduras, o glabra y lisa; lígula membranácea, hialina, frecuentemente dilacerada, o entera de ápice obtuso, de 0.5–3 mm de long., glabra o con algunos pelos esparcidos; láminas foliares linear-lanceoladas, involutas, de ápice agudo no punzante, de 5–15 × 0.1–0.3(–0.4) cm, de faz dorsal glabra, escabriúscula, con márgenes pestañosos, faz ventral cortamente pilosa. Inflorescencia en panoja lanceolada estrecha o lineal, generalmente pauciflora, de 10–22 × 1.5(–4) cm, de ramas verticiladas aproximadas al raquis, las basales mayores de hasta 6 cm de long., glabras, escabriúsculas; raquis glabro, escabriúsculo; pedicelos curvos, pilosos. Espiguillas comprimidas dorsiventralmente, pajizas, de 5–8 mm de long., con 2, raramente 1 antecio(s) inferior(es) hermafrodita(s) y 1 a 3 neutros terminales reducidos a las lemas rudimentarias, formando un cuerpo apical; raquilla articulada por debajo de las glumas, estas caducas con el antecio maduro; glumas diferentes en forma y tamaño, papiráceas, hia-

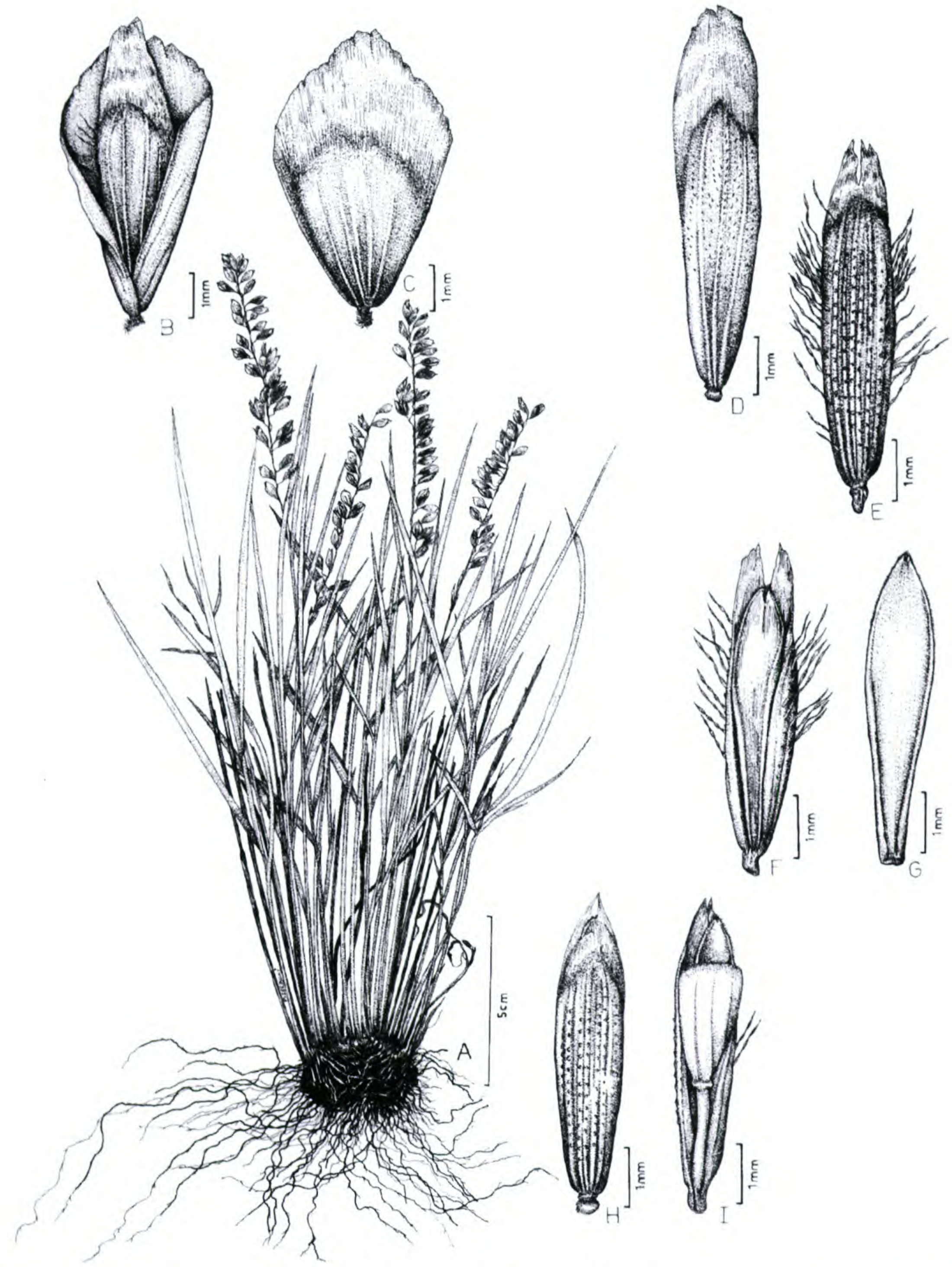

Figura 1. *Melica animarum* J. Mujica & M. Marchi. —A. Hábito. —B. Espiguilla, vista ventral. —C. Gluma inferior, vista dorsal. —D. Gluma superior, vista dorsal. —E. Lema I, vista dorsal. —F. Antecio basal, vista ventral. —G. Pálea I, vista dorsal. —H. Antecio II, vista dorsal. —I. Antecio II, vista ventral y cuerpo apical. Dibujos basados en el holotipo, *J. Mujica 240.*

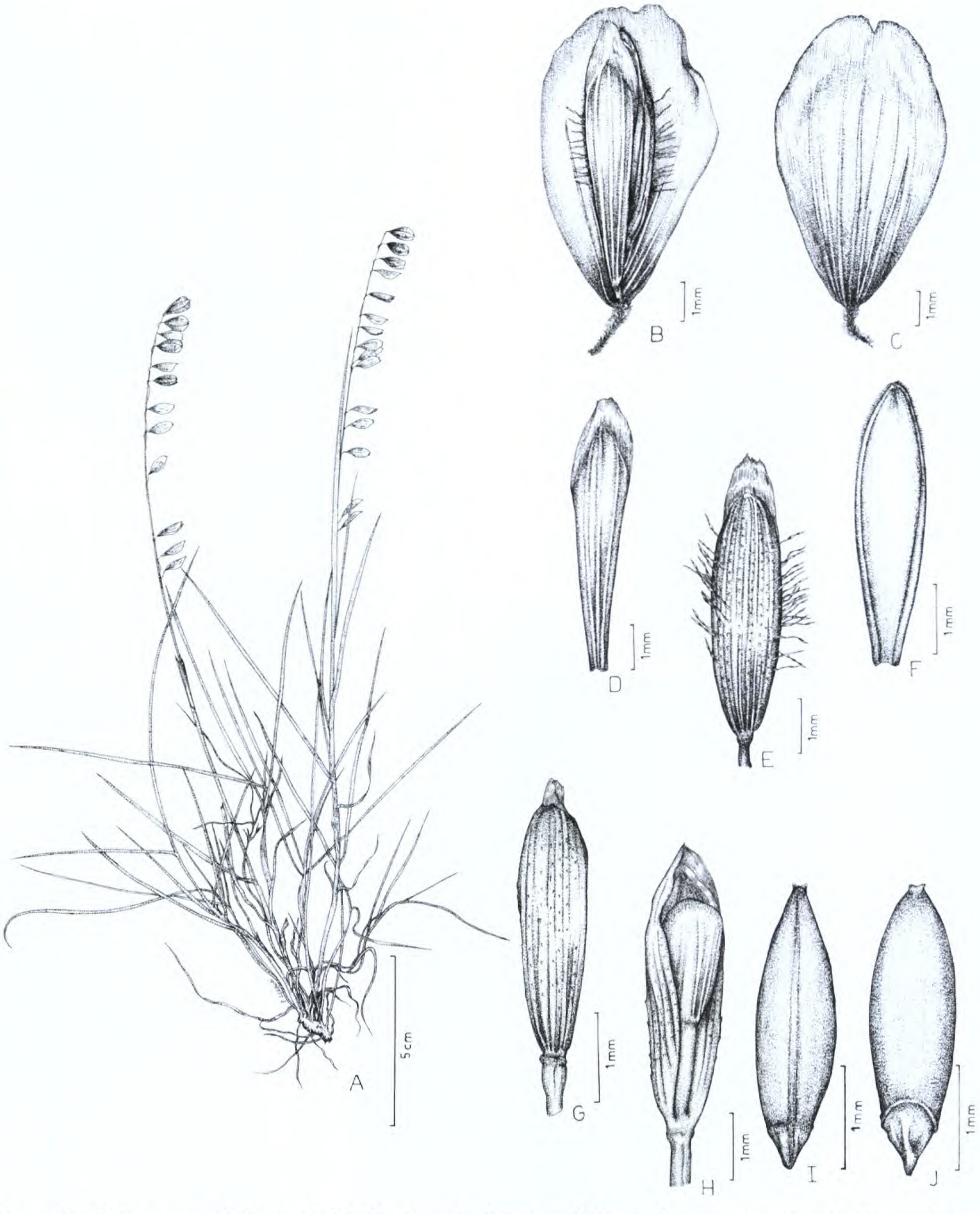

Figura 2. *Melica serrana* J. Mujica & M. Marchi. —A. Hábito. —B. Espiguilla, vista ventral. —C. Gluma inferior, vista dorsal. —D. Gluma superior, vista dorsal. —E. Lema I, vista dorsal. —F. Pálea I, vista dorsal. —G. Antecio II, vista dorsal. —H. Antecio II y cuerpo apical. —I. Cariopse, vista ventral. —J. Cariopse, vista dorsal. Dibujos basados en los paratipos *M. Marchi et al. 1464* (A–H) y *M. Marchi et al. 1465* (I, J).

linas en los márgenes y en el ápice; gluma inferior obovada, de ápice emarginado de bordes irregulares, pajiza, glabra, lisa, con una amplia zona hialina apical, de 6–8 × 4–5.4 mm, 7–9-nervada; gluma superior oblanceolada, de ápice obtuso, eroso, irregular, dorso glabro y liso, o con escasos pelos cortos sobre el extremo superior de las nervaduras o en los dos tercios superiores del dorso, a veces con escasas asperezas antrorsas superiormente, con una amplia zona hialina apical de 1.1–1.4 mm de long., 5-nervada, de (6.1–)6.5–7.2 × 1.2–2 mm. Primer antecio hermafrodita con lema elíptica, de ápice

irregular eroso, dorso con nervaduras engrosadas, con asperezas retrorsas, pelos hialinos, retorcidos de hasta 0.7 mm de long. sobre las nervaduras laterales, de 4.6–5.5 mm (incluyendo el ápice hialino de 0.6–0.7 mm de long.) × 1.2–1.7 mm; pálea elíptica, oblanceolada, de ápice bidenticulado, 2-nervada, nervaduras cilioladas superiormente, dorso glabro y liso o con micropapilas puntiformes entre carenas, de 4–5 × 0.9–1.6 mm; segundo antecio hermafrodita, similar al basal, pero algo menor y glabro; antecios superiores neutros, reducidos a las lemas rudimentarias, incluidas una dentro de la otra, constituyendo un cuerpo apical oblongo; estambres 3, con anteras cleistógamas de 0.6 mm de long.; ovario glabro, con 2 estigmas plumosos. Cariopsis elipsoideo, de hilo linear, que se extiende de extremo a extremo; glabro, liso, castaño lustroso, de 2.7–3 × 0.9 mm.

Melica serrana es una especie endémica del Cerro de las Ánimas, siendo observada en campo arbustivo localizado a media altura (aproximadamente a 250 m s.m.). No se observó su ocurrencia en otros lugares de la Sierra. Esta especie fue colectada a fines de noviembre, presentando algunos ejemplares con cariopsis maduros. *Melica serrana* es afín a *M. hyalina*, diferenciándose principalmente por su gluma inferior obovada, de ápice emarginado e irregular, y por su lema de ápice irregular eroso.

Paratipos. URUGUAY. **Maldonado:** Sierra de Ánimas, Cerro de las Ánimas, 27 Nov. 1995, *M. Marchi, J. Mujica & R. Brescia 1461, 1464a, 1465, 1466* (MVFA), *1467* (MO).

Agradecimientos. Agradecemos a la Ing. Primavera Izaguirre de Artucio por todo el apoyo recibido en el Uruguay; al Ing. Raul Brescia por su colaboración en los trabajos de campo; al Dr. Roberto Rossiello e Dra. Ariane Luna Peixoto, por su importante estímulo; al Sr. Pierino Zerboni por las ilustraciones; y al Dr. Tarciso Filgueiras por las diagnosis latinas. Agradecemos también a la Comisión Sectorial de Investigación Científica (CSIC), de la Universidad de la República, por el subsidio otorgado; y a la Cátedra de Botánica de la Facultad de Agronomía de Montevideo, por las facilidades brindadas.

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A New Species of *Beilschmiedia* (Lauraceae) from Borneo

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ABSTRACT. A new species of *Beilschmiedia*, previously recognized by Kostermans but never published, is described as *B. oligantha* and illustrated. This new species differs from the other Bornean *Beilschmiedia* species in the combination of the following characters: long erect trichomes on twigs, six to ten pairs of secondary leaf veins, relatively large pale red flowers, and stamens with short pubescent filaments.

Key words: *Beilschmiedia*, Borneo, Lauraceae.

Beilschmiedia Nees is one of the larger genera of Lauraceae and includes about 250 species distributed mainly in the paleotropics (Nishida, 2001). It is distinguished from the other laurel genera by its paniculate or racemose inflorescences that are not strictly opposite at the terminal division, bisexual and trimerous flowers with six equal to subequal tepals, nine (rarely six) fertile stamens with two-celled anthers, and fruits lacking cupules. One of the centers of species diversity is Southeast Asia, but the taxonomy of the genus in this region is still confused because of the lack of a comprehensive revision.

While revising the specimens from Borneo, one of the larger islands in this region, I found several groups of specimens that were informally recognized as new species by Kostermans, but never published. These specimens were annotated by him with unpublished names, and some of them were even placed in type folders at a few herbaria, e.g., BO, K. Since these names have caused taxonomic confusion, I clarified the published names for the Bornean *Beilschmiedia* species and described one new species in my last publication (Nishida, 2001). Recently, I found another group of specimens that is different from any known Bornean *Beilschmiedia* species. It is distinct from other species in the combination of the following characters: long erect trichomes on twigs, six to ten pairs of secondary leaf veins, and large (ca. 5 mm) pale red flowers, as well as stamens with short pubescent filaments. I conclude that it represents a new species and describe it here.

Beilschmiedia oligantha Sachiko Nishida, sp. nov. TYPE: Malaysia. Sarawak: Kapit, Pelagus, 11 July 1979, *B. Lee S40647* (holotype, L; isotypes, K not seen, KEP, SAN not seen, SAR). Figure 1.

Ab aliis speciebus borneensibus, ramulis patenter pilosis, nervis secondariis 6–10 utrinque, floribus rubris 5 mm longis, filamentis pubescentibus et brevibus differt.

Small tree, up to 10 m tall; terminal buds and twigs densely pubescent with erect, long (up to 1.5 mm), straight trichomes. Leaves spirally and evenly arranged on branches, (14)17–20(24) × (4)5–10 cm, obovate or sometimes elliptic, chartaceous, base acute, apex acuminate or cuspidate, margin flat, upper leaf surface pubescent only along midrib, lower surface sparsely pubescent with erect, long, straight trichomes, lower surface glaucous; midrib almost immersed above, raised below, secondary veins 6 to 9(10) pairs, almost immersed above, raised below, tertiaries not percurrent, minor venation relatively fine, smallest reticulations ca. 2 mm diam., slightly raised (the smallest veins immersed) above, slightly raised below; petioles 1.5–2 cm long, flat to slightly canaliculate above, densely pubescent throughout. Inflorescences axillary, paniculate, 1–5 cm long, each bearing a few to 30 flowers, rachis reddish tinged, densely pubescent; floral pedicels of lateral divisions ca. 1 mm long, pedicels of central flowers ca. 2–3 mm long; bracts as large as flowers. Flowers pale red, ca. 5 × 5 mm; tepals 6, almost equal, ovate, ca. 3.5 × 2.5 mm, glabrate outside, sparsely pubescent inside; stamens 9, ca. 2 mm long, 2-celled, the outer 6 with the cells opening introrsely, inner 3 opening extrorsely or laterally; filaments pubescent, shorter than anthers, the inner 3 filaments with 2 globose glands near the base; anthers glabrous with ovate apex; staminodes 3, ca. 1.5 mm long, sagittate; pistil glabrous, ca. 3 mm long, ovary gradually narrowed in the style; receptacle relatively deep, pubescent inside. Fruits ellipsoid, ca. 2.8 × 1.5 cm, drying reddish black, surface smooth; fruit pedicels ca. 2 mm diam., apically constricted.

Habitat and distribution. In forests dominated

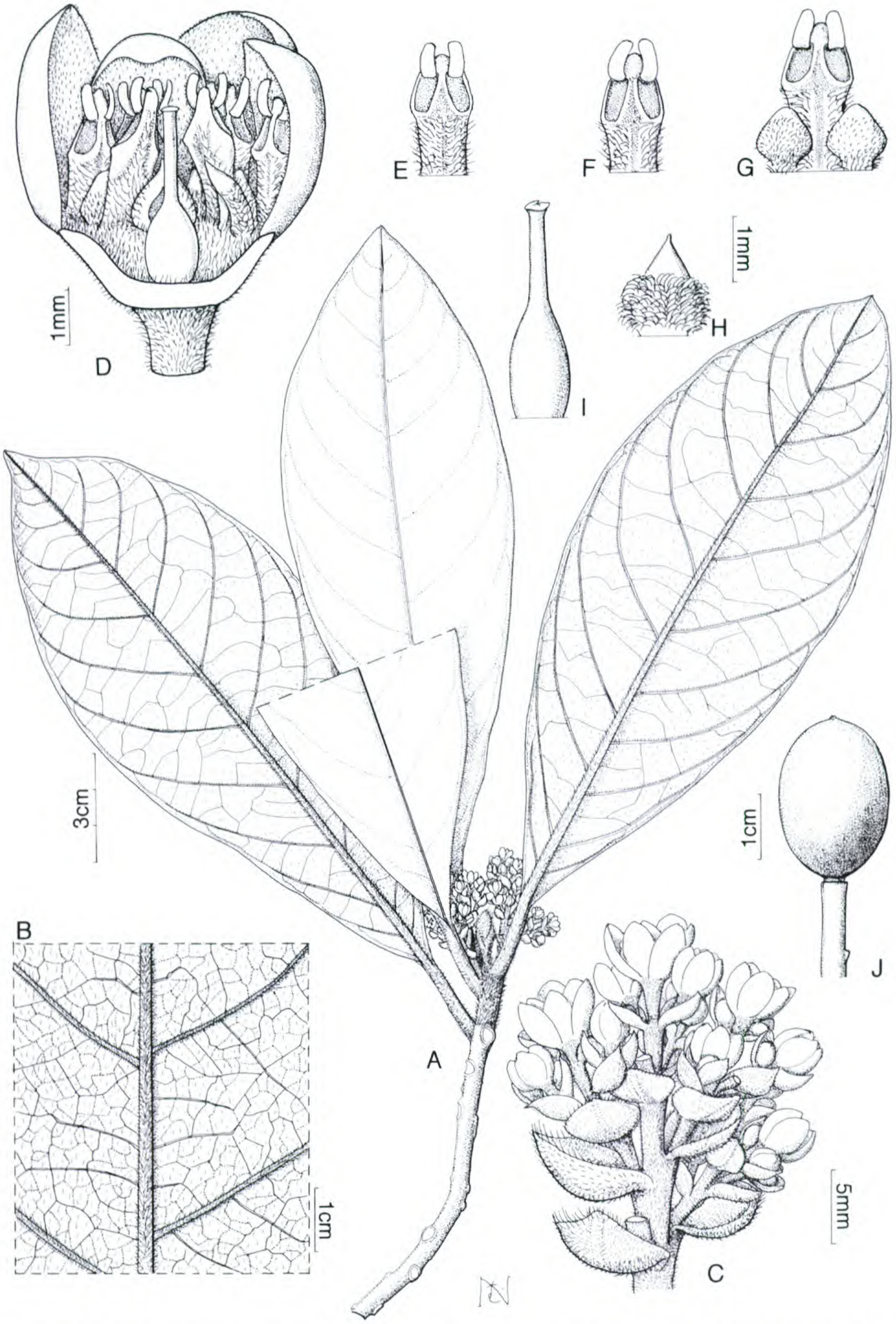

Figure 1. *Beilschmiedia oligantha* Sachiko Nishida. —A. Habit. —B. Venation pattern (abaxial view). —C. Inflorescence. —D. Flower (front tepals removed). —E. First whorl stamen (adaxial view). —F. Second whorl stamen (adaxial view). —G. Third whorl stamen with glands (abaxial view). —H. Staminode (abaxial view). —I. Pistil. —J. Fruit. A, B, D–I. Drawn from the holotype (*B. Lee S40647*). C. Reconstructed from the holotype and isotypes. J. Drawn from a paratype (*Sibat ak Luang S22158*, SAR).

Table 1. Differences between *Beilschmiedia oligantha* and Bornean species morphologically close to *B. oligantha*.

Features	*B. oligantha*	*B. maingayi*	*B. pilosa*	*B. wieringae*
Leaf length (cm)	(14)17–20(24)	16–25(30)	(24)28–30(34)	(16)18–24
Secondary veins (pairs)	6 to 9(10)	8 to 10	(13)14 to 17	8 to 11
Leaf shape	obovate to elliptic	elliptic	lanceolate, rarely narrowly elliptic	elliptic
Petiole length (cm)	1.5–2	1.8–3	1.5–2.3	2–3.5
Flower color	pale red	yellowish green	red	white
Stamen filament length	shorter than anthers	shorter than anthers	as long as anthers	longer than anthers
Stamen filament	pubescent	pubescent	glabrate	glabrate
Fruit pedicels	apically constricted	not constricted	apically constricted	apically constricted

by Dipterocarpaceae ("mixed dipterocarp forests"), 15–1400 m; known only from northwestern Borneo.

This is one of the species informally recognized as new, but never published, by Kostermans. He wrote the name "*Beilschmiedia pauciflora*" on specimens belonging to this species, but this name was already given to a different species (*Beilschmiedia pauciflora* H. W. Li). Thus, I translated the epithet into Greek as an alternative, *Beilschmiedia oligantha*, crediting Kostermans's earlier determination.

Beilschmiedia has about 30 known species in Borneo (Nishida, 2001). Among these, *B. oligantha* is most closely related to *B. maingayi* Hooker f. Both share a similar leaf shape and inflorescence structure. However, *B. oligantha* differs from *B. maingayi* in its pilose twigs, pale red flowers, and fruit pedicels that are apically constricted (Table 1). Collections of *B. oligantha* have occasionally been misidentified as *B. pilosa* Kostermans and *B. wieringae* Kostermans, due to their similar indument type. However, *Beilschmiedia oligantha* can be distinguished from *B. pilosa* by its shorter leaves (blade length (14)17–20(24) cm vs. (24)28–30(34) cm in *B. pilosa*) with fewer pairs of secondary veins (6 to 9(10) vs. (13)14 to 17) and pubescent filaments (vs. glabrate). The new species also differs from *B. wieringae* by its shorter petioles (1.5–2 cm vs. 2–3.5 cm in *B. wieringae*), pale red flowers (vs. white), and stamens with short pubescent filaments (vs. stamens with glabrate filaments longer than anthers) (Table 1).

Paratypes. MALAYSIA. **Sarawak:** Bintulu, Bukit Mersing, *Sibat ak Luang S21877* (L, SAR), *Sibat ak Luang S21886* (L, SAR), *Sibat ak Luang S22158* (L, SAR), *J. W. Purseglove 5276* (K, L); Sungai Kakus, ca. 4 km E from Minah, *M. Hirano & M. Hotta 205* (SAR); Miri, Lambir Hills, *Ilias P. S16615* (L, SAR), *Rena G. S40280* (L, SAR). **Sabah:** Beaufort, Beaufort Hill, *J. K. Lajangah 44514* (K, L, SAN); Keningau, Sg. Siliawan Sepulut For. Res., *Pidilis K. SAN113919* (K, L); Keningau, Kerumatoi laut Batu 7 ½ Sook, *Saikeh L. SAN73254* (L, SAN); Keningau, Ulu Sg. Matud, *Sumbing J. SAN119569* (SAN); Kinabalu, Kampung Malangkap Tamis, Sungai Kinotoki 4 km dari Malangkap Tamis, *L. Lugas 712* (K); Nabawan, KM 55 Jalan Nabawan/Sepulut, Ulu Sg. Nabawan, *Sumbing SAN128374* (L). BRUNEI. **Brunei-Muara:** Lumapas, Bukit Sa'eh, *Ogata, Ariffin K & Han S. Og-B105* (L), *Joffre Hj. Ali Ahmad, Niga N., Sharbini M., Ibrahim A. & Jangarun E. BRUN15389* (L, SAN), *Joffre, Niga, Ariffin, Hussain H. O., Ibrahim & Han. BRUN16741* (L); Bukit Lumapas, on banks along stream at base of Bukit Sa'eh, *A.P. Davis, Bygrave P.C., Kirkup D., Niga, Joffre, Han, Ibrahim 512* (K). **Belait:** new road to Merankin from km 13 Labi Road, ca. 3 km from junction, *J. Dransfield 6847* (L); Sukang, *P. S. Ashton BRUN116* (BRUN, L); Sukang, Sungei Kuat, Ulu Belait, *Salleh I., Ibrahim A., Melinau G. Emran K., Arfin K. & Clayton J. BRUN15342* (L). **Temburong:** Kuala Belalong, ridge bounded by Belalong and Temburong rivers, S of Belalong, *K. M. Wong 1234* (L). INDONESIA. **Kalimantan Timur:** between Long Bawan and Panado, *R. Geesink 8990* (L).

Acknowledgments. I am grateful to Mutsuko Nakajima for providing the excellent illustration, and to Hidetoshi Nagamasu for improving the Latin diagnosis. I also thank the curators of A, BO, K, KEP, L, SAN, and SAR for loans.

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Lupinus reitzii (Fabaceae–Faboideae), a New Species of the *Lupinus lanatus* Complex from Southern Brazil

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ABSTRACT. *Lupinus reitzii*, a new species from southern Brazil, is described and illustrated. The new species belongs to the *Lupinus lanatus* complex and is closely related to *L. lanatus* and *L. magnistipulatus*, from which it is set apart principally by the size and shape of the stipules and by the shape and pubescence of the leaflets.

RESUMO. É descrita e ilustrada *Lupinus reitzii*, uma nova espécie do Sul do Brasil. *Lupinus reitzii* é relacionada com os táxons do complexo *Lupinus lanatus*, especialmente *L. lanatus* e *L. magnistipulatus*, diferenciando-se destas principalmente pelo tamanho e forma das estípulas, forma e pilosidade dos folíolos.

Key words: Fabaceae–Faboideae, *Lupinus lanatus* complex, *Lupinus reitzii*, southern Brazil.

During a revision of the genus *Lupinus* L. in the Brazilian state of Rio Grande do Sul (Pinheiro & Miotto, 2001), we had the opportunity to study the type material of *L. magnistipulatus* Burkart ex Planchuelo & Dunn and verify that some of the paratypes present morphological differences from the isotype (*Reitz 2377*, HBR). In 1961, Burkart, while analyzing the collections *Smith & Reitz 9155* (HBR) and *10135* (US, HBR), wrote on these sheets that they represented a new species, which he dubbed *L. reitzii*, but never validated the name (Pinheiro & Miotto, 2001). Later, Planchuelo and Dunn (1989) considered these collections to represent young individuals of *L. magnistipulatus* and referred them to this species. Our analysis of specimens determined as *L. magnistipulatus*, with additional collections from southern Brazil, indicates that a new species is represented among these collections and is herein described.

Lupinus reitzii Burkart ex M. Pinheiro & Miotto, sp. nov. TYPE: Brazil. Santa Catarina: Vargeão, BR 282, km 476, 31 Oct. 1999 (fl), *M. Pinheiro 207* (holotype, ICN; isotypes, K, MBM, MO). Figure 1.

Herbae probabiliter biennes, erectae, secundum caules ramosae. Folia basalia unifoliolata et trifoliolata, altera 5-foliolata, interdum folia trifoliata in ramis lateralibus; foliola late oblanceolata ad angusta oblanceolata, apice rotundato, marginibus undulatis, sparse utrinque lanosis, pili flavescentes, undulati et mixti; stipulae petiolo adnatae, parte distali libera, lanceolata vel lanceolato-caudata, apice acuminato, interdum acuto, dorsaliter lanosae, ventraliter glabrae. Racemi terminales, densiflori; bracteae caducae, lanceolato-caudatae, dorsaliter lanosae, ventraliter glabrae. Flores rosei, roseo-purpureive vel colore indico tincti; calyx labio infero trifido, labio supero profunde bifido; alae oblongae, apice rotundato. Legumina lanosa; semina elliptica.

Plants probably biennial, herbaceous, erect, branched along the stem, (12)18.5–70 cm tall, sometimes in cushions more than 50 cm diam.; stem finely or densely lanate. Basal leaves unifoliolate and trifoliolate, evident only in juvenile plants; adult leaves sometimes trifoliolate in lateral branches, mostly 5- to 7(8)-foliolate; leaflets 3–8(9.5) × 1–3 cm, widely to narrowly oblanceolate, apically rounded, margins undulate, finely lanate on both sides, with sparse intertwined trichomes yellow-tinged, about 5–7 mm long; petioles 2.3–12.5(15) cm; stipules (11)18–70 mm, partly adnate to petioles, the free portion 8–38(49) × 3–9(13) mm, lanceolate to lanceolate-caudate, the apex acuminate, sometimes acute, glabrous adaxially, lanate abaxially. Terminal racemes, densiflorous, 25- to 50-flowered, 4.6–20.0 cm; peduncles (1.3)3–6.6(8.9) cm; rachis densely lanate; pedicels 1.5–4.7(6) mm, pilose as the rachis; bracts 10.7–16 × 2.1–4.2 mm, caducous, lanceolate-attenuate to lanceolate-caudate, lanate abaxially. Flowers 10–15.2 mm, pink, purple-pink, or indigo; bracteoles 2.5 mm long, lanceolate, rarely oblanceolate, glabrous within, finely to densely lanate outside; calyx glabrous within, finely to densely lanate outside; lower lip 11–14 × 2.7–4.5 mm, the apex trifid with central tooth 1.8–3.8 mm and lateral teeth 1.2–3.4 mm; upper lip deeply bifid, 6.3–9 × 4.1–6 mm; laciniae 1.8–2.8 mm wide, with a notch between them 4.1–6.9 mm deep; corolla with standard 13–16.8 × 7.8–12.3 mm, ovate, sometimes widely ovate or oblong-ovate; wings 13.5–18.4 × 4.7–7.6 mm, oblong, apex rounded, the claw 2.4–3.8 mm long;

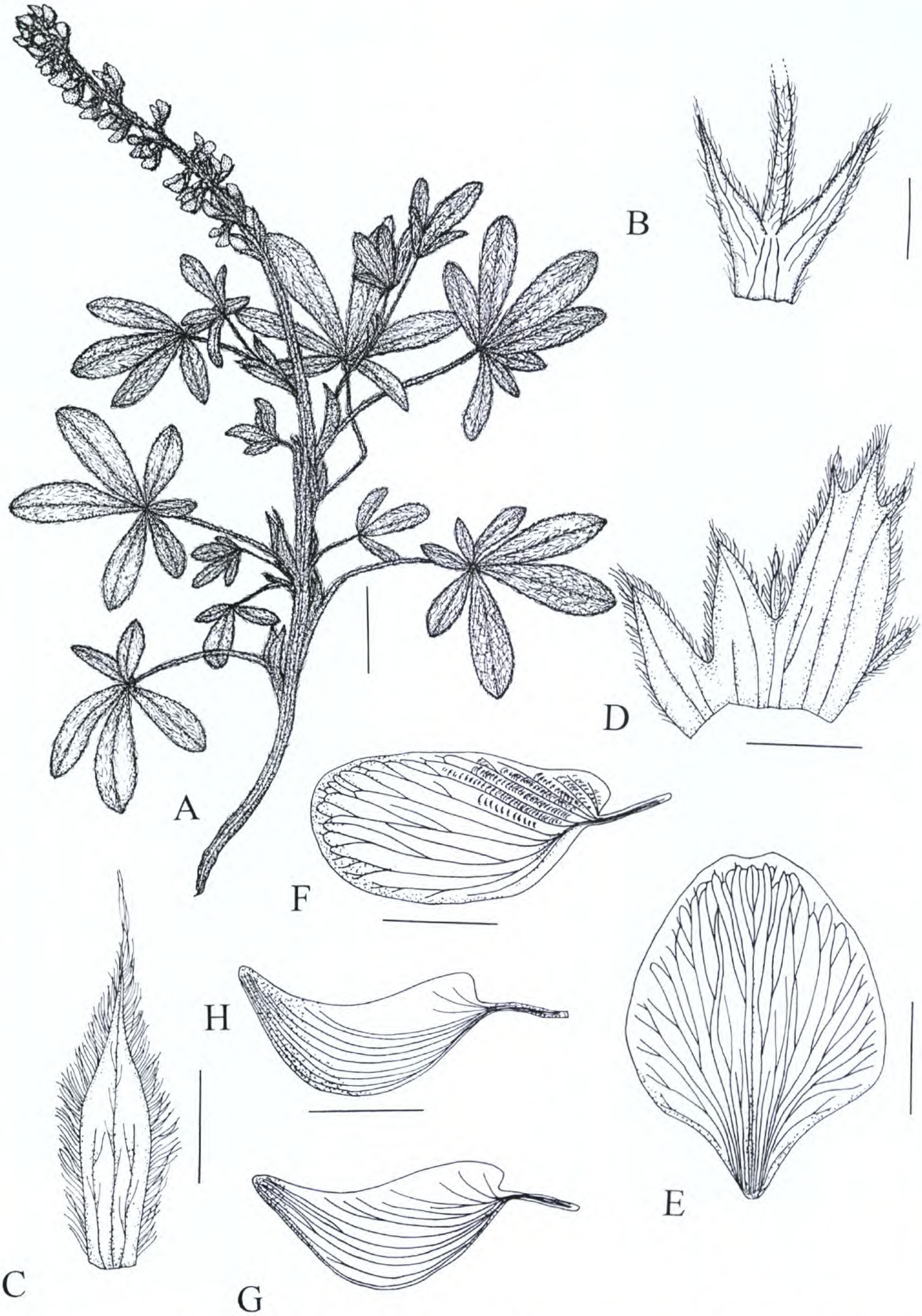

Figure 1. *Lupinus reitzii* Burkart ex M. Pinheiro & Miotto. —A. Flowering branch. —B. Stipules. —C. Bract, ventral view. —D. Calyx, inside surface. —E. Banner petal, ventral view. —F. Wing petal. —G, H. Keel petals. Scale bars = 4 cm in A; 2 cm in B; 5 mm in C–H. (A–G: drawn from the type, *M. Pinheiro 207*; H: *M. Pinheiro 318*.)

keels 12.6–16.6 × 3.8–5.4 mm, the apex falcate, straight or twisted upward, rarely abruptly falcate-arcuate, the claw 3–4.5 mm long; ovary with 7 ovules. Legumes (33)43–64(74) × 7–9 mm, densely lanate; seeds 4.2–4.6 × 3–3.4 mm, elliptic.

Habitat and distribution. *Lupinus reitzii* was collected in sunny places on roadsides and bare rocky soils in the southern Brazilian states of Rio Grande do Sul, Santa Catarina, and Paraná.

Phenology. Flowering and fruiting plants were collected from October to January.

Etymology. The epithet "reitzii" is an homage to Brazilian botanist Raulino Reitz.

Pinheiro and Miotto (2001), after a morphological analysis of the isotype of *L. magnistipulatus* (*R. Reitz 2377*, HBR) and the paratypes (*L. B. Smith, R. Reitz & R. M. Klein 7703*, HBR, US; *L. B. Smith & R. Reitz 10326*, HBR, R, US; *R. Reitz & R. M. Klein 7417*, HBR), verified that these were the only specimens examined by Planchuelo and Dunn (1989) which belong to *L. magnistipulatus*, while the other paratypes examined belong to *L. reitzii*. Moreover, Pinheiro and Miotto (2001), during the revision of *Lupinus* in Rio Grande do Sul, based on the morphological analysis (stipules, leaflets, banner, and calyx) of *L. magnistipulatus* and *L. setifolius* Planchuelo & Dunn, concluded that both species are the same taxon, justifying the synonymization of *L. setifolius*. It should be emphasized that in the holotype photo of *L. magnistipulatus* (*R. Reitz 2377*, SI), there are many notes written by Burkart, who indicated that this specimen is identical to the specimen *B. Rambo 36208* (isotype, PACA), designated by Planchuelo and Dunn as the holotype of *L. setifolius*.

Planchuelo and Dunn (1989) considered the presence of trichomes on the leaflets a distinguishing characteristic to separate *L. magnistipulatus* (hairy leaflets) from *L. setifolius* (glabrous leaflets). However, the analysis of *L. magnistipulatus* populations demonstrated an intraspecific variation concerning their pubescence (Pinheiro & Miotto, 2001). Moreover, it can be emphasized that the description of *L. magnistipulatus* sensu Planchuelo & Dunn also includes vegetative and reproductive morphological characteristics of *L. reitzii*, which has hairy leaflets.

The analysis of the *L. magnistipulatus* and *L. setifolius* types, as well as of a great number of specimens, in addition to field observations, allowed a better understanding of these taxon circumscriptions and the adoption of *L. reitzii* as a new species.

Lupinus reitzii is closely related to *L. magnistipulatus* and *L. lanatus* Bentham. From *L. magnistipulatus* it is set apart mainly through the morphology of the stipules and leaflets, as well as the flower color. The stipules in *L. reitzii* are lanceolate to lanceolate-caudate with an acuminate to acute apex, with the free part 8–38(49) × 3–9(13) mm, while in *L. magnistipulatus* they are lanceolate to ovate-lanceolate with an acute apex, the free part 11–56.3 × 4.4–22.0(25.2) mm; the leaflets in *L. reitzii* are widely to narrowly oblanceolate, both faces lanate with sparse intertwined yellow-tinged trichomes, while in *L. magnistipulatus* the leaflets are widely oblanceolate to obovate, glabrous or only occasionally lanose on both sides with sparse intertwined white trichomes. Flowers are pink to purple-pink, rarely indigo, in *L. reitzii*, while they are consistently indigo in *L. magnistipulatus*.

Lupinus lanatus differs from the new species by the densely white or whitened lanose, narrowly elliptic to elliptic-oblanceolate leaflets with plane margins and an obtuse or rounded apex, as well as the apices of the wings, which are rounded in *L. reitzii*, but have an obtuse beak in *L. lanatus*. The flowers in *L. lanatus* are blue or rarely white, contrasting with the pink, purple-pink, to deeper indigo of *L. reitzii*.

The geographical distribution of these *Lupinus* species is also distinct: *Lupinus magnistipulatus* is known from isolated scattered populations restricted to the montane fields from Rio Grande do Sul and Santa Catarina, in the highest and coldest environments of southern Brazil (Pinheiro & Miotto, 2001), while *L. reitzii* is widespread in southern Brazil; *L. lanatus* occurs in Santa Catarina and Rio Grande do Sul, where it is also widespread.

Paratypes. BRAZIL. **Paraná:** Guarapuava, Guará, 5 Dec. 1968, *G. Hatschbach 20492* (MBM, US), *H. Brücher 3065* (K); São José dos Pinhais, 18 Oct. 1980, *G. Hatschbach 43218* (K). **Rio Grande do Sul:** Bom Jesus, estrada para São José dos Ausentes, 16 Nov. 1997, *J. A. Jarenkow & E. N. Garcia 3635a* (PEL); Cambará do Sul, de Osvaldo Kroeff, para São José dos Ausentes, 5 Jan. 2000, *S. T. S. Miotto & M. Pinheiro 1844* (ICN); Itaimbezinho próx. de São Francisco de Paula, 13 Nov. 1953, *Rambo 54507* (B, PACA); Caxias do Sul, Vila Oliva, 29 Oct. 1985, *M. L. Abruzzi 1027* (HAS); São Francisco de Paula, 30 Oct. 1995, *S. T. S. Miotto et al. 1456* (ICN); estrada para Serra do Umbu, 23 Oct. 1998, *A. Flores 239* (ICN); ca. 11 km do rio Pinto, 23 Nov. 1998, *M. Pinheiro 128* (ICN); São José dos Ausentes, em direção a Silveira, 6 Jan. 2000, *M. Pinheiro 310* (ICN); Silveira, ca. 2 km em direção a Bom Jardim da Serra, 6 Jan. 2000, *M. Pinheiro 313* (ICN). **Santa Catarina:** Água Doce, margem do rio Chapecó, 4 Dec. 1964, *L. B. Smith & Klein 13552* (R); próx. à Caçador, 2 Dec. 1964, *L. B. Smith & Klein 13393* (B, R); 14 km E de Bom Jardim da Serra, 25 Nov. 1980, *A. Krapovickas & R. Vanni 36933* (CETS); Bom Jardim da Serra, 6 Jan. 2000, *M. Pinheiro 318* (ICN); Caçador, Campos das Palmas, 52 km O de Caçador Joaçaba, 24 Dec. 1956, *L. B. Smith & R. Reitz 9155* (HBR); Capão Alto, SC 458,

km 181, a 12 km do trevo da BR 116, 30 Oct. 1999, *S. T. S. Miotto 1763* (ICN); Campo Belo do Sul, km 163, ca. 12 km da divisa com o mun. Campos Novos, 30 Oct. 1999, *M. Pinheiro 198a* (ICN); Lages, km 247, perímetro urbano, 2 Nov. 1999, *M. Pinheiro 225* (ICN); Ponte Serrada, BR 282, km 450, 31 Oct. 1999, *M. Pinheiro 205* (ICN); para Faxinal dos Guedes, 13 Oct. 1964, *L. B. Smith & Reitz 12480* (FLOR, R); para Xanxerê, 8 Nov. 1964, *L. B. Smith & Klein 13054* (US); Ponte Alta do Norte, BR 116, km 165, 02 Nov. 1999, *M. Pinheiro 221* (ICN); São Cristóvão do Sul, BR 116, km 198, 2 Nov. 1999, *M. Pinheiro 223* (ICN); São Joaquim, nascente do rio Capivaras, serra do Oratório, 10 km E de Bom Jardim da Serra, 16 Jan. 1957, *L. B. Smith & Reitz 10135* (HBR, US), 22 Oct. 1961, *G. Pabst 6220 & E. Pereira 6393* (HB, PEL); Vargeão, BR 282, km 476, em direção a Faxinal dos Guedes, 31 Oct. 1999, *M. Pinheiro 206* (ICN).

Acknowledgments. We are grateful to Marcos Sobral for his help, incentive, and suggestions; to Tarciso Filgueiras for the Latin description; to Márcia Vignoli da Silva for the illustrations; and to Capes, CNPq, and Pronex for financial support of our studies.

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A New Species of *Amyris* (Rutaceae) from Baja California Sur, Mexico

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ABSTRACT. Field exploration and floristic research have revealed another plant species endemic to the peninsula of Baja California, Mexico. A new shrubby species (*Amyris carterae*) from the Sierra Guadalupe and Sierra de la Giganta, Baja California Sur, is described here. Distribution, associated vegetation, rarity, affinity to another species in the genus, and a botanical illustration are presented.

RESUMEN. Trabajo de campo e investigación florística han puesto de manifiesto una especie de planta endémica de la península de Baja California, México. Un arbusto (*Amyris carterae*) de la Sierra Guadalupe y Sierra de la Giganta, del estado de Baja California Sur se describe aquí como especie nueva para la ciencia. Se presentan la distribución, vegetación asociada, rareza, afinidad con otra especie en el género, así como una ilustración del nuevo taxon.

Key words: *Amyris*, Baja California Sur, Mexico, Rutaceae.

Lower California is comprised of two Mexican states (Baja California and Baja California Sur) that are politically divided at the 28th parallel. These states compose the Baja California peninsula and its adjacent islands, which are located in both the Gulf of California (Sea of Cortés) and the Pacific Ocean. This region supports a wealth of species. Wiggins (1980) estimated that a total of 2958 taxa, of which 686 are endemic, occur in Lower California, but recent discoveries and a more extensive overview of the literature suggests that the flora probably consists of more than 4000 plant taxa with a rate of endemism around 30% (Rebman, 2001).

The Rutaceae are represented in Lower California by eight native species in six genera (*Amyris* P. Browne, *Cneoridium* Hooker f., *Esenbeckia* HBK, *Ptelea* L., *Thamnosma* Torrey & Frémont, and *Zanthoxylum* L.). At least four of these species (the new species *Amyris carterae*, as well as *Thamnosma trifoliata* I. M. Johnston, *Zanthoxylum arborescens* Rose, and *Z. fagara* (L.) Sargent) are rare or restricted in their distribution on the peninsula. The genus *Amyris* has approximately 40 species distributed from Florida, Texas, and the Antilles, south to Venezuela and Peru (Gereau, 1991). At present, only this species of *Amyris* is known to occur on the peninsula of Baja California; the member of the genus with the closest geographical proximity is *A. balsamifera* L. in southern Sonora and Sinaloa in Mexico. A collection (*M. Domínguez 235*, SD) made in the Sierra de la Laguna of the Cape Region may represent another species of this genus, but more research and better collections are needed to substantiate this occurrence. The new shrubby species described here adds to the impressive diversity and endemism of the flora of Lower California.

Amyris carterae J. Rebman & F. Chiang, sp. nov. TYPE: Mexico. Baja California Sur: Sierra Guadalupe, W of Mulegé, Guadalupe Canyon ca. 14 mi. SW of San José de Magdalena, 500 m, 26°56′54″N, 112°22′15″W, 25 Sep. 1998, *J. P. Rebman 5634 & J. L. Zuniga* (holotype, SD 142880; isotypes, BCMEX, HCIB, MEXU, MO, RSA). Figure 1.

A. madrensi similis, sed differt foliolis supra non nitidis, venis lateralibus non prominente elevatis, inflorescentia constanter pubescenti, et crescit in solo volcanico.

Rounded to spreading shrub, to 7 m tall, most branches ascending to erect, the stems densely pubescent with spreading hairs, canescent especially on newer growth. Leaves opposite to subopposite, 4-ranked, odd-pinnately compound; petioles gray, tomentose, 5–11 mm long; lateral petiolules 1–3 mm long, the terminal one 2–5 mm long; leaflets 3 to 9, 7–21 mm long, 5–20 mm wide, the leaflet

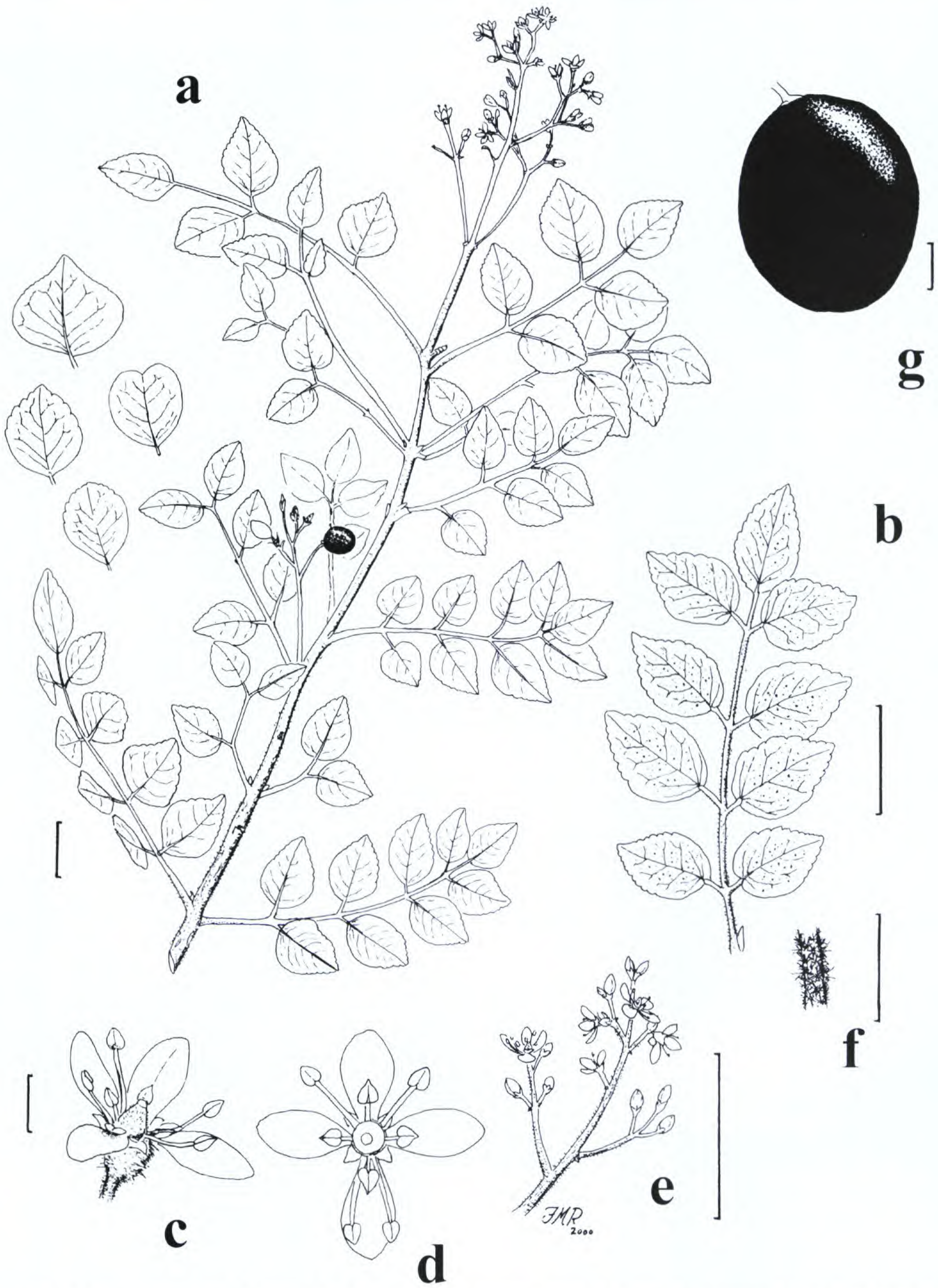

Figure 1. *Amyris carterae* J. Rebman & F. Chiang. —a. Stem segment with leaves, inflorescence, and variable leaflets, scale bar = 1 cm. —b. Leaf, bar = 1 cm. —c, d. Flower, bar = 1 mm. —e. Part of paniculate inflorescence, bar = 1 cm. —f. Pubescence on petiole and rachis, bar = 2 mm. —g. Mature fruit, bar = 1 mm. Drawn from the type material (*Rebman 5634*) except for the fruit (g), which was drawn from *Rebman 6038*.

shape variable, mostly ovate, but also broadly elliptic or orbicular, the margin crenate or rarely entire, the apex acute to obtuse, rarely emarginate, the base cuneate to rounded, sometimes slightly cordate; upper leaflet surface dark green, densely brown punctate, puberulent but glabrescent with age, the lower surface gray to light green, sparsely punctate, densely pubescent and velvety. Inflorescence a terminal or axillary panicle, densely pubescent and velvety. Flowers small, perfect; calyx light green, densely pubescent, with 4 triangular lobes to 1 mm long; petals 4, free, white, obovate, 2–3 mm long, with a central patch of oil-gland dots and simple hairs on the abaxial surface of each petal; stamens 8, of which 4 are shorter in length and alternate with longer ones, separate; anthers with longitudinal dehiscence. Fruit a 1-seeded drupe, ellipsoid to ovoid, black at maturity, 9–13 × 8–11 mm, puberulent with simple, spreading hairs.

Phenology. Flowering September to November.

Distribution and habitat. Endemic to the state of Baja California Sur; elevations 390–1000 m; occurring in canyon bottoms and lower slopes on volcanic substrates usually associated with vegetation dominated by *Lysiloma divaricatum* Bentham, *Ficus palmeri* S. Watson, *Celtis reticulata* Torrey, *Sebastiania bilocularis* S. Watson, *Stenocereus thurberi* (Engelmann) Buxbaum, and *Fouquieria diguetii* (Tieghem) I. M. Johnston. Other plant species present in the canyon community with *Amyris carterae* include: *Acacia kelloggiana* A. M. Carter & Rudd, *Acalypha subviscida* S. Watson, *Bursera laxiflora* S. Watson, *Carlowrightia pectinata* Brandegee, *Carminatia tenuiflora* DC., *Croton sonorae* Torrey, *Dicraurus alternifolius* (S. Watson) Uline & Bray, *Eupatorium peninsulare* Brandegee, *Ferocactus peninsulae* (Engelmann ex Weber) Britton & Rose var. *peninsulae*, *Galium moranii* Dempster subsp. *aculeolatum* Dempster, *Hedyotis brevipes* (Rose) W. H. Lewis, *Jatropha cinerea* (Ortega) Müller Argoviensis, *J. vernicosa* Brandegee, *Justicia candicans* (Nees) L. D. Benson, *Priva lappulacea* (L.) Persoon, *Pseudabutilon thurberi* (A. Gray) Fryxell, *Solanum americanum* Miller, *Tithonia thurberi* A. Gray, *Tournefortia volubilis* L., and *Vallesia laciniata* Brandegee.

Etymology. This new taxon honors the late Annetta Carter, an enthusiastic botanist who contributed greatly to our floristic knowledge of Baja California Sur. Carter collected intensively (including paratypes of this new species) in the Sierra de la Giganta, where together with the Sierra Guadalupe are the only known localities for this new taxon. The common name of this species that is used by the ranchers at Rancho Pie de la Cuesta near the type locality is "gobernadora." This common name is normally used, however, for *Larrea tridentata* (Sessé & Moçiño) Coville in most of Mexico including parts of the Baja California peninsula.

Amyris carterae is most similar to *Amyris madrensis* S. Watson, which it superficially resembles in most aspects, but it does not have an upper leaf surface that is glossy or lustrous and the lateral veins are not prominent or obviously raised. The populations of *A. carterae* occur on volcanic substrates in northwestern Mexico, quite disjunct from those of *A. madrensis*, which are restricted to limestone substrates in central and northeastern Mexico and adjacent Texas (Standley, 1923; Wilson, 1911). There is, in addition, a report of *A.* cf. *madrensis* from the state of Jalisco (Lott, 1993), on the Pacific coast. A consistent feature of *Amyris carterae* is the pubescence, always present in the inflorescence and young leaves, the leaves becoming glabrescent, whereas in *A. madrensis* the pubescence may be present or absent.

Paratypes. MEXICO. **Baja California Sur:** Sierra de la Giganta W of Loreto, betw. Arroyo de las Parras & Arroyo de Santo Domingo, 30 Nov. 1950, *Carter & Kellogg 2844* (MEXU); Cañón del Cayuco, E base of Cerro de la Giganta, 7 Oct. 1951, *Carter & Kellogg 3124* (MEXU); betw. La Victoria & Rancho Santa María, W of Notrí, 22 Mar. 1960, *Carter & Ferris 3960* (MEXU); S side of Valle de los Encinos, 8 Nov. 1960, *Carter 4129* (MEXU); cañada S of Rancho de Los Encinos, Valle de los Encinos, 7 June 1963, *Carter & Reese 4558* (MEXU); vicinity of Ojo de Agua del Carrizal, N from Rancho Viejo, 22 Sep. 1965, *Carter 5005* (MEXU); Sierra Guadalupe, near "Los Encinos," SW of Rancho San Sebastián, 29 Nov. 1953, *Carter & Kellogg 3273* (MEXU); Arroyo de los Gueribos, 25 Oct. 1997, *J. J. Pérez Navarro 1054* (HCIB, SD); W of Mulegé at San Borjitas archeological area, 20 Sep. 1997, *Rebman 4251, N. Roberts & N. Villavicencio* (BCMEX, HCIB, MEXU, SD); Canyon Guadalupe, just SW of Rancho Pie de la Cuesta, betw. San José de Magdalena & ex-Mision Guadalupe, 29 Oct. 1997, *Rebman 4674* (MEXU, SD); W of Mulegé, W side of Cumbra de San Pedro betw. ex-Mision Guadalupe & San Juan de las Pilas, 29 Apr. 1998, *Rebman 5241 & J. L. Zuniga* (SD); Guadalupe Canyon, E of the ex-Mision Guadalupe & near Rancho Pie de la Cuesta, 13 Oct. 1999, *Rebman 6038, D. Silverman, M. Wellik, & C. Graf* (BCMEX, SD).

Acknowledgments. This work was supported in part by funds from the National Geographic Society (Grant # 6022-97) and from Sven Lindblad and Special Expeditions, who funded the 1997 Lindblad Binational, Multidisciplinary Expedition to central Lower California organized by the San Diego Natural History Museum. Our gratitude is extended to the SD Herbarium staff (especially Judy Gibson) and volunteers for their continued assis-

tance with floristic research projects. A special thanks goes to Fred Roberts for supplying the botanical illustration. The first author is indebted to the many people who have joined and helped him with fieldwork on the flora of Lower California, especially José Luís León de la Luz at HCIB and José Delgadillo at BCMEX, both invaluable friends and colleagues. A special thanks to the appropriate Mexican authorities for granting permits and to Exequiel Ezcurra and Patricia Beller for their efforts in obtaining the papers and permits needed to conduct field research and to collect plant species in the region.

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Tigridia suarezii (Iridaceae, Tigridieae), a New Species from Jalisco, Mexico

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ABSTRACT. *Tigridia suarezii* (Iridaceae, Tigridieae) is a new species from Mexico. Its distinguishing features are the dark purple, almost black color of the spreading tepal limbs and the white to cream floral cup with dark purple spots and stripes. It is morphologically similar to *T. alpestris* subsp. *obtusa* and *T. venusta*, from which it differs in the more robust habit of the plant, the shape, length, and width of the tepals, and the length of the anther, filament column, and style branches. *Tigridia suarezii* and *T. venusta* inhabit the understory in pine-oak forests in an altitudinal range from 2080 to 2800 m, whereas *T. alpestris* subsp. *obtusa* grows on exposed rocky slopes above 3000 m. *Tigridia suarezii* is known only from the state of Jalisco.

RESUMEN. *Tigridia suarezii* (Iridaceae, Tigridieae) es una especie nueva para México. Se caracteriza por el color púrpura, casi negro de la parte distal de los tépalos y el color blanco o crema con manchas o rayas púrpuras de la copa floral. Su morfología es similar a *T. alpestris* subsp. *obtusa* y *T. venusta* de las que se distingue por su hábito más robusto y en la forma, longitud y ancho de los tépalos. También son diferentes en la longitud de las anteras, la columna estaminal y las ramas del estilo. *Tigridia suarezii* y *T. venusta* crecen en el sotobosque del bosque de pino y encino en un rango altitudinal de 2080 a 2800 m. En contraste, *T. alpestris* subsp. *obtusa* crece en acantilados rocosos por encima de los 3000 m de altitud. *Tigridia suarezii* se conoce únicamente del estado de Jalisco.

Key words: Iridaceae, Jalisco, Mexico, *Tigridia*.

The iris family, Iridaceae, was divided into four subfamilies, Isophysidoideae, Nivenioideae, Ixoideae, and Iridoideae, by Goldblatt (1990). Similarly, the subfamily Iridoideae was divided into four tribes: Tigridieae, Sisyrinchieae, Irideae, and Mariceae. The tribe Tigridieae comprises the bulbous and plicate-leafed genera of Iridaceae and is found exclusively in the New World. It has radiated extensively in temperate and Andean South America and in Mexico. Tigridieae include 19 genera and approximately 140 species.

Tigridia Jussieu is the largest genus of Tigridieae, with 50 species. The group has a notable disjunction with 37 species in Mexico and Guatemala and 13 species in the South American Andes. Thirty species are endemic to Mexico. *Tigridia* is taxonomically difficult and, since Molseed (1970), no other monographic study for the genus has been completed. In addition, this group is underrepresented in Mexican herbaria, and three species have been described based on single collections. Floral characters useful to define species may be poorly preserved when dried, making further taxonomic/morphological analysis problematic.

In the course of systematic studies of the tribe Tigridieae, Rodríguez et al. (1996) reported a new locality for *Tigridia alpestris* Molseed subsp. *obtusa* Molseed in the state of Jalisco. This species was previously known only from its type locality in the Cerro de Tancítaro in the state of Michoacán (Molseed, 1970; Espejo & Lopez-Ferrari, 1996); however, a direct comparison with fresh material was not possible at that time. A collecting trip in August 2002 gave us the opportunity to compare fresh material of *T. alpestris* subsp. *obtusa* from the type locality and these plants from Jalisco. An analysis of floral characters led us to conclude that the plants from Jalisco belong to an unrecognized species, which is described below.

Tigridia suarezii Aarón Rodríguez & L. Ortiz-Catedral, sp. nov. TYPE: Mexico. Jalisco: Mpio. de Tapalpa, camino de Juanacatlán a Tepec, 2330 m, 26 Aug. 1987, *A. Rodríguez & J. C. Suárez-Jaramillo 972* (holotype, IBUG; isotypes, ENCB, MEXU, MO, UAMIZ). Figure 1.

Folia basalia nulla, folia caulina binaria; flores plures, erecti, crateriformes; cupula alba atropurpureo maculata; tepala externa ovato-elliptica, parte basali eburnea, parte supra cupulam patente atropurpurea; tepala interna ovata, concava, unguiculata, obtusa, alba vel eburnea, maculis atro-purpureis; glandula alba vel cinerascens ad tepalorum partem basalem posita, cordata; antherae liberae oblongae ascendentes, per totam longitudinem fertiles; styli

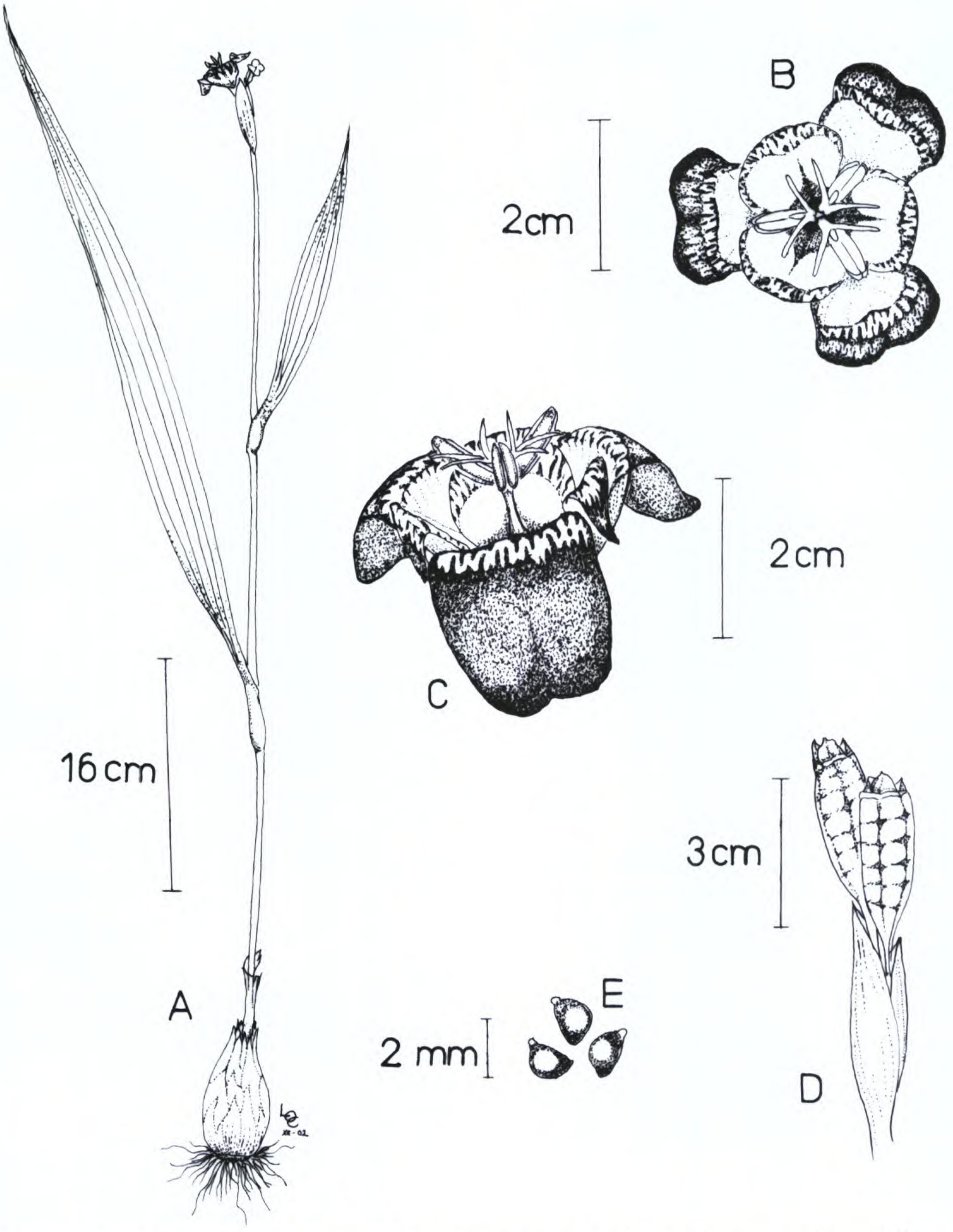

Figure 1. *Tigridia suarezii* Aarón Rodríguez & L. Ortiz-Catedral. —A. Habit. —B. Flower, cross-view. —C. Flower, lateral view. —D. Fruits. —E. Seeds. A, D, E, drawn from the type, *Rodríguez & Suárez 972* (IBUG); B, C, drawn from *Rodríguez et al. 3058* (IBUG).

Table 1. Morphological comparison of *Tigridia suarezii* and related taxa.

Character	*T. suarezii*	*T. alpestris* subsp. *obtusa*	*T. venusta*
Stem length (cm)	58–80	30–47	33–60
Flower diameter (cm)	2.6–3.5	2	4
Flower color	dark purple stripes and spots on a creamy white background	uniformly dark purple with some pale yellow stripes	dark purple stripes and spots on a creamy white background
Flower position	erect	erect	erect or secund
Outer tepal length (mm)	20–23	12.5–18	22–25
Outer tepal width (mm)	8–10	6–7.5	10–11
Inner tepal length (mm)	14–16	11–13	12–15
Inner tepal width (mm)	9–10	4–6.5	6–10
Column length (mm)	7–7.5	5.4–6	4–5
Anther length (mm)	7–7.5	5–6	12–13
Style branches length (mm)	5–5.5	3–4	9.5–11.5
Nectary bands length (mm)	9–9.5	5.5–7	4
Nectary bands width (mm)	6–8	4.4–5	3

ramuli bipartiti, ad apicem declinati, eburnei; mucro in sinubus styli ramorum instructum; capsula oblongo-clavata; semina pyriformia castanea.

Erect, bulbous perennial herb, stem 58–80 cm high, with 2 or 3 branches, glabrous; bulb ovoid, 4–7 × 2–3 cm, the outer tunics thin, pale brown. Basal leaves none; cauline leaves 2, linear, the lower 50–113 × 1.6–6.2 cm, upper one shorter, 10–25 × 0.6–2.4 cm. Inflorescence in a rhipidium with boat-shaped subequal spathes, 5.5–6.5 × 0.7 cm. Flowers 5 to 7 per rhipidium, erect, bowl-shaped, 2.6–3.5 cm diam.; outer tepals ovate-elliptic, clawed, basally cream to white, distally dark purple, 20–23 × 8–10 mm; inner tepals ovate, concave, clawed, obtuse, with dark spots and stripes over a white to creamy background, 14–16 × 9–10 mm; nectary at base of inner tepals, cordate, white to grayish, 9–9.5 × 6–8 mm; filaments connate in a column, 7–7.5 mm long; anthers oblong, ascending, 7–7.5 mm long; style branches 5–5.5 mm long, deeply bifid into 2 style arms slightly declined at apex, ivory-colored; an obvious mucro inserted between style arms; ovary 7–8 mm long. Fruit a capsule, oblong-clavate, 25–35 mm long; seeds brown pyriform with a chalazal crest.

Tigridia suarezii is most closely related to *T. alpestris* subsp. *obtusa*. They share the dark purple, nearly black color of the spreading tepal limbs. Both species have erect flowers, exposed nectaries, and a mucro between the style arms. However, *T. suarezii* differs from *T. alpestris* subsp. *obtusa* in having a more robust habit and larger and broader leaves. In addition, the flowers of *T. suarezii* are larger than those of *T. alpestris* subsp. *obtusa*. The tepals of *T. alpestris* subsp. *obtusa* are dark purple to wine-colored with pale yellow stripes around the floral cup, whereas *T. suarezii* presents white to cream tepals with dark spots and stripes at their bases. The inner tepals of *T. suarezii* are ovate while those of *T. alpestris* subsp. *obtusa* are elliptic to lanceolate. The filament column is longer in *T. suarezii* than in *T. alpestris* subsp. *obtusa*. Finally, there are differences in their habitat preferences in Mexico. *Tigridia alpestris* subsp. *obtusa* grows on exposed rocky slopes above 3000 m surrounded by fir-pine forest in the state of Michoacán in west-central Mexico, whereas *T. suarezii* inhabits the understory in pine-oak forests in an altitudinal range from 2080 to 2800 m in the state of Jalisco in western Mexico.

The outer tepals of *Tigridia suarezii* are distally dark purple. This color pattern resembles that of *T. venusta*; however, the outer tepals of *T. suarezii* are ovate-elliptic, while those of *T. venusta* are oblong. Moreover, the anthers of *T. venusta* are fertile only in their apical portion, whereas those of *T. suarezii* are fertile along their full length. Lastly, the style branches for *T. venusta* are about twice as long as the style branches for *T. suarezii*. The distinguishing characteristics of *T. suarezii*, *T. alpestris* subsp. *obtusa*, and *T. venusta* are presented in Table 1.

Distribution and habitat. *Tigridia suarezii* is known only from the Sierra de Tapalpa and Cerro Viejo in the state of Jalisco in western Mexico. Common associated elements are *Arbutus* L. and *Rhus* (Tournefort) L. The soil is predominantly silty, black and rich in organic matter. The blooming period extends from August to October.

Etymology. The specific epithet honors José C. Suárez-Jaramillo, first collector of the species and

a noted enthusiastic collector and photographer of Mexican *Tigridia*.

Paratypes. MEXICO. **Jalisco:** Amacueca, camino entre Juanacatlán y Tepec, 20°3′0″N, 103°30′0″W, *A. Rodríguez 2800* (ENCB, IBUG, IEB, MEXU, MO, UAMIZ, WIS, XAL); Chiquilistlán, brecha Tapalpa-Chiquilistlán a 1 km de la línea municipal, *A. Rodríguez & J. Suárez 532* (ENCB, IBUG, MEXU); brecha Tapalpa-Chiquilistlán, *Rodríguez & Suárez 973* (CHAPA, ENCB, IBUG, IEB, MEXU, MO, NY, UAMIZ, WIS, XAL); laderas del cerro El Chichimeco, brecha Tapalpa-Chiquilistlán, 1.5 km NW de la torre de estación de microondas Chiquilistlán, 20°0′0″N, 103°47′0″W, *Rodríguez 2801* (ENCB, IBUG, IEB, MEXU, MO, NY, UAMIZ, WIS, XAL); Jocotepec, Cerro Viejo vereda de la Ventanilla a el Filo, 20°21′42″N, 103°26′27″W, *J. A. Machuca 8983* (ENCB, IBUG, IEB, MEXU); Tapalpa, brecha entre Juanacatlán y Tepec, *Rodríguez & Suárez 585* (IBUG), *1577* (ENCB, IEB, IBUG, MEXU); 11.5 km a partir de Tapalpa sobre la brecha a Chiquilistlán, 20°0′06″N, 103°49′05″W, *A. Rodríguez et al. 3058* (IBUG).

Acknowledgments. We thank Jorge Alberto Pérez de la Rosa from the Universidad de Guadalajara and Ignacio García Ruiz from the Centro Interdisciplinario de Investigación para el Desarrollo Integral Regional, Unidad Michoacán, for their support in the field. We also thank Antonio Machuca who gave us the opportunity to analyze material collected by him. The illustration was made by Luis Ortiz-Catedral.

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A New Species of *Microlicia* (Melastomataceae) from Minas Gerais, Brazil

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ABSTRACT. A new species in *Microlicia* (Melastomataceae) is described and illustrated. *Microlicia tenuifolia* is known from the rocky slopes of Diamantina, Minas Gerais state, an important center of endemism for Melastomataceae species. It resembles morphologically *M. isophylla* DC., but it can be distinguished by the smaller leaves and pedicels and calyx lobes with an acute non-apiculate apex.

RESUMO. Uma nova espécie de *Microlicia* (Melastomataceae) é descrita e ilustrada. *Microlicia tenuifolia* ocorre nos campos rupestres dos arredores de Diamantina, no estado de Minas Gerais, um importante centro de endemismo para espécies de Melastomataceae. Assemelha-se morfologicamente a *M. isophylla* DC., mas pode ser distinta pelas folhas e pedicelos menores e lacínias do cálice com ápice agudo, não apiculado.

Key words: Brazil, "campo rupestre," highland vegetation, Melastomataceae, *Microlicia tenuifolia*, Minas Gerais.

During the course of a taxonomic study of the Neotropical species of *Microlicia* D. Don, a new species from Diamantina, Minas Gerais state, Brazil, was discovered. The genus consists of approximately 100 endemic species in the Brazilian states of Minas Gerais, Goiás, and Bahia (Romero, 2003) with a few outlying taxa in Peru (Brako & Zarucchi, 1993), Bolivia and Guyana (Wurdack & Renner, 1993), and Venezuela and Colombia (Berry et al., 2001). Species of *Microlicia* are mostly shrubs or subshrubs, with 5-merous, pedicellate to subsessile, solitary flowers, and capsular fruits with dehiscence longitudinal from the apex to the base.

Microlicia tenuifolia R. Romero, sp. nov. TYPE: Brazil. Minas Gerais: estrada para Conselheiro Mata, a 14 km da rodovia, 13 Dec. 1980, *I. Cordeiro, N. L. Menezes, J. R. Pirani & A. Furlan 591* (holotype, HUFU; isotypes, MO, RB, SPF, UEC). Figure 1.

Suffrutex 0.4–1 m altus, caulis teres glaber; ramuli quadrangulati punctato-glandulosi. Laminae sessiles erectae elliptico-lanceolatae 1–3 × 0.2–0.5 mm margine integerrima utrinque densiuscule impresso-punctata, 1–3-nervae. Flores solitarii; petala magenta apice acuminata; ovarium 3-loculare.

M. isophyllae DC. maxime affinis sed praecipue lamina et pedicello brevioribus diversa.

Subshrub, 0.4–1 m tall, branching dichotomously or trichotomously, young branches fastigiate; stem terete, glabrous; young branches quadrangular, glutinous, covered with sessile glands, older branches brown, quadrangular, leafless proximally, leaf scars conspicuous, glabrescent. Leaves sessile, blade erect, adpressed, rarely slightly spreading, 1–3 × 0.2–0.5 mm, lanceolate to elliptic, apex acute or obtuse, base truncate-obtuse, margin entire, covered with sessile glands on both surfaces, glutinous or not, 1- to 3-nerved, with inconspicuous lateral veins. Flowers 5-merous, solitary, terminal; pedicels 0.5–1 mm long; hypanthium 2–3 × 1.5–2.5 mm, campanulate, 5- to 10-costate, rugose, glutinous, covered with sessile glands, calyx lobes 1.5–2.5 mm long, triangular-lanceolate, apex acute, not apiculate, covered with sessile glands; petals 6–10 × 4–6(–8) mm, magenta, obovate, apex acuminate, margin entire; stamens 10, dimorphic, larger stamens 5, the filaments 1–2 mm long, purple, the thecae 1.0–1.5 mm long, purple, ovate to oblong, not corrugate, with rostrum ca. 0.2 mm long, white, the connective prolonged 1.5–2 mm, purple, with ventral appendage ca. 1.0 mm long, yellow, expanded and slightly bilobed; smaller stamens 5, the filaments 1.5–2 mm long, purple, the thecae ca. 1 mm long, yellow, ovate, not corrugate, with rostrum ca. 0.2 mm long, the connective prolonged ca. 0.6 mm long, yellow, without ventral appendage; ovary superior, 3-locular, glabrous; style ca. 3 mm long, filiform, glabrous, stigma punctiform. Capsule 3–4 × 2–3 mm, greenish brown, globose; seeds 0.4–0.5 × ca. 0.3 mm, numerous, slightly curved, foveolate.

Distribution and ecology. *Microlicia tenuifolia* is characterized by being a subshrub with slender, fastigiate branches, very small leaves, costate hypanthium, long calyx lobes, and dimorphic stamens. Endemic to the region around Diamantina,

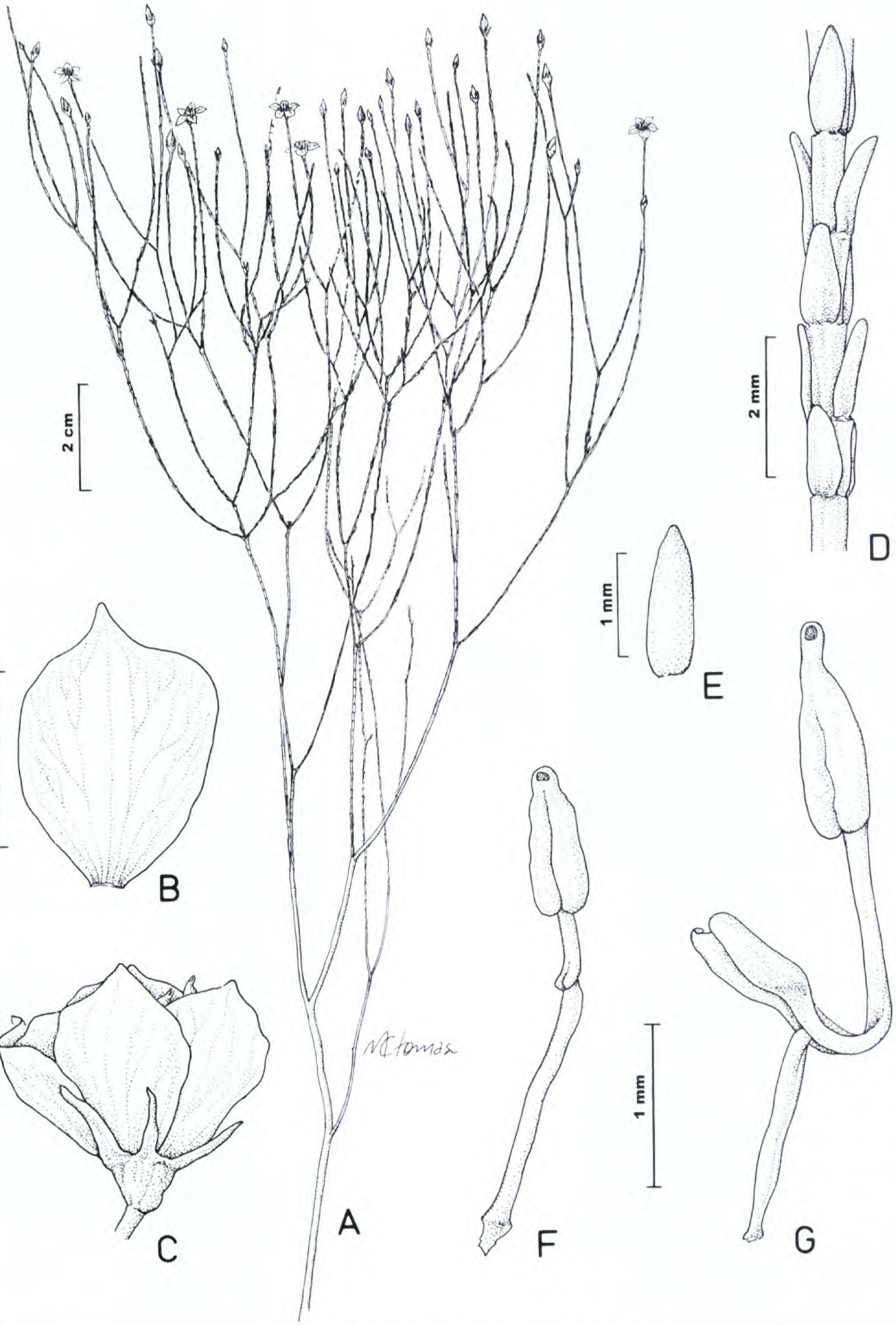

Figure 1. *Microlicia tenuifolia* R. Romero. —A. Habit. —B. Petal. —C. Flower, hypanthium, and calyx lobes. —D. Detail of the branch and insertion of the leaves. —E. Leaf. —F. Lateral view of small stamen. —G. Lateral view of large stamen. Drawn from the paratype *Splett 622* (HB).

Minas Gerais state, where it is locally common in campo rupestre.

Phenology. Flowering specimens have been collected from June to December; fruiting specimens have been collected in January, April, May, August, September, and October.

The first gatherings of this species were made by Auguste Glaziou in 1892 from localities near Diamantina, Minas Gerais state (*Glaziou 19200, 19201*). Glaziou (1908) subsequently listed both gatherings under *Microlicia denudata* Cogniaux. However, this identification, although perpetuated by most subsequent collectors/authors, is erroneous. *Microlicia denudata* Cogniaux seems to be known only from the type gatherings from Goiás (*Gardner 3731*). Isotypes of *Microlicia denudata* seen by the author at BM and K have a hypanthium covered with dense stalked glands mainly on the apex, eventually with caducous glands, triangular-lanceolate calyx lobes setose with acute apex, ciliate margin, and lanceolate leaves with entire margin and acute, apiculate apex, and are thus quite different from the *Glaziou 19200* and *19201* gatherings. These two latter gatherings represent a hitherto undescribed species, which I describe herein as *Microlicia tenuifolia.* Gatherings of *Glaziou 19200* at C and K were determined as "*M. denudata* var. *brevifolia* Cogniaux," and those of *Glaziou 19201* at C, K, and OUPR were determined as "*M. denudata* var. *fastigiata* Cogniaux," although neither varietal name was validly published by Alfred Cogniaux or indeed by anyone else.

Microlicia tenuifolia resembles *M. isophylla* DC., which occurs in São Paulo, Minas Gerais, and Rio de Janeiro states. Both have erect, lanceolate to elliptic leaves with entire margins and both surfaces covered with sessile glands. The leaves 1–3 × 0.2–0.5 mm, pedicels 0.5–1 mm long, and calyx lobes with an acute non-apiculate apex distinguish *M. tenuifolia* from *M. isophylla. Microlicia isophylla* has larger (3–7 × 1–2 mm) leaves, pedicels 1.5–2 mm long, and calyx lobes with an acute, apiculate apex.

Paratypes. BRAZIL. **Minas Gerais:** Diamantina, s.d., *A. Glaziou 19200* (C, K, P—3 sheets), 9 Apr. 1892, *A. Glaziou 19201* (C, F, K, OUPR, P, R, US); Conselheiro Mata, Lama Preta, June 1934, *Brade 13717* (US); ca. 12 km SW of Diamantina, 18 Jan. 1969, *H. S. Irwin, R. R. Santos, R. Souza & F. Fonseca 22190* (K, NY, RB, US); Guinda, 7 Sep. 1971, *G. Hatschbach 27364* (HUFU, MBM, US); Planalto Diamantina, 7 Oct. 1972, *A. P. Duarte 14026* (US); estrada Diamantina–Corinto, 1 Dec. 1976, *G. J. Shepherd, J. B. Andrade, L. S. Kinoshita & J. Y. Tamshiro 3890* (NY, UEC); 24 km na estrada Diamantina–Conselheiro Mata, 30 Aug. 1981, *A. M. Giulietti, N. M. L. Menezes, J. Semir & A. J. Mattos 1831* (HUFU, SPF, UEC, US); km 66 da estrada Curvelo–Diamantina, Serra do Brejo Grande, 9 Apr. 1982, *A. Furlan, L. Rossi, N. M. L. Menezes, N. Hensold, H. L. Wagner & E. M. Isejima 3253* (SPF, US); estrada Diamantina–Conselheiro Mata, km 174, 10 Sep. 1986, *N. L. Menezes, T. B. Cavalcanti & J. C. C. Gonsçalves 10298* (HUFU, SPF, US); estrada Diamantina–Conselheiro Mata, 23 Sep. 1994, 20.3 km depois do asfalto, *Splett 622* (SPF, UB, US); estrada para Gouveia, 11 Oct. 1996, *W. Marcondes-Ferreira, A. O. Simões & R. Belinello 1347* (UEC); estrada para Gouveia ca. 10 km de Diamantina, 3 Oct. 1997, *M. L. Kawasaki & A. Rapini 1055* (HUFU, SP); estrada Diamantina–Gouveia, ca. 12 km sul de Diamantina, 30 Mar. 2001, *R. Romero & J. N. Nakajima 6065b* (HUFU, NY, UEC); estrada Diamantina–Conselheiro Mata (km 162), ca. 29 km do trevo, 1 Apr. 2001, *R. Romero & J. N. Nakajima 6095* (HUFU).

Acknowledgments. I am grateful to the Universidade Federal de Uberlândia for the facilities of the Herbarium Uberlandense (HUFU), the curators of B, BHCB, C, F, HB, HUFU, MBM, NY, OUPR, R, RB, SP, SPF, UB, UEC, and US for loans of specimens, Conselho Nacional de Desenvolvimento Científico e Tecnológico for a research grant, the Margaret Mee Foundation for a fellowship to visit BM, K, P, and W, and Maria Cecília Tomasi for preparing the illustration. I thank Peter Gibbs for correcting the English and for helpful suggestions, and John Pruski for useful suggestions and for corrections to the draft.

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Plectranthus igniarioides (Lamiaceae), a New Species from Somalia

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ABSTRACT. *Plectranthus igniarioides* Ryding, a new species from northern Somalia, is described and illustrated. Comparison is made with *P. argentifolius* Ryding, *P. bariensis* Ryding, *P. cuneatus* (E. G. Baker) Ryding, *P. gillettii* J. K. Morton, *P. igniarius* (Schweinfurth) Agnew, and *P. puberulentus* J. K. Morton. The circumscription of *Plectranthus gillettii*, which has been reported to occur in Somalia, is refined to include only the material known from Ethiopia and Kenya.

Key words: Labiatae, Lamiaceae, *Plectranthus*, Somalia.

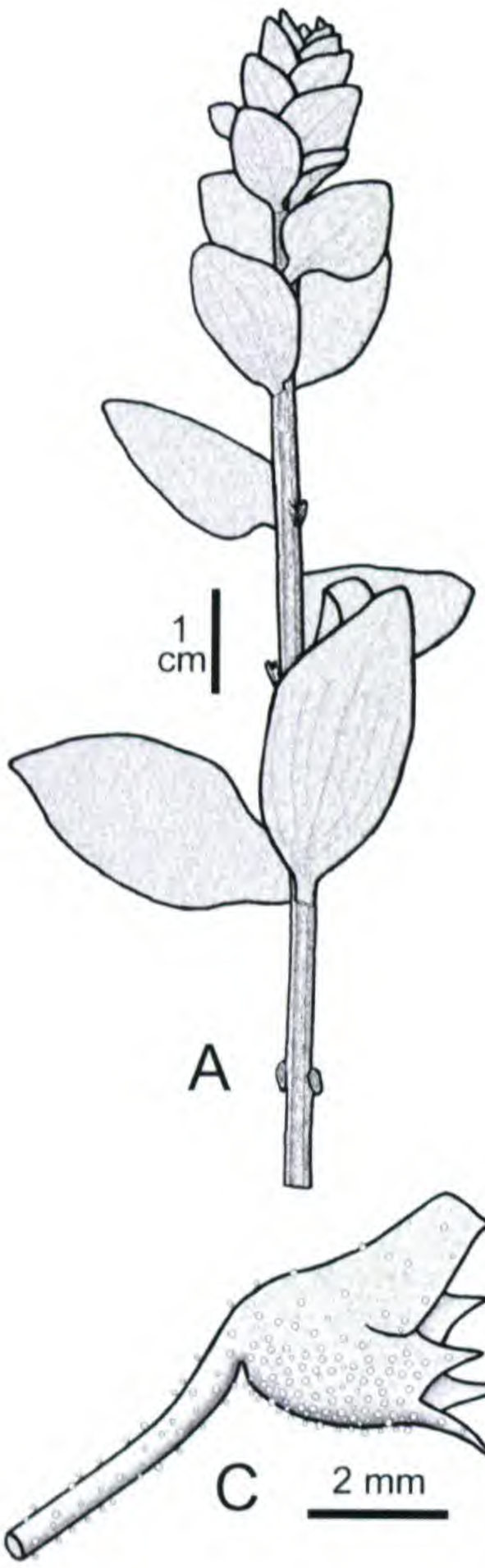
The genus *Plectranthus* L'Héritier (including *Coleus* Loureiro and *Capitanya* Gürke) belongs to Lamiaceae subfamily Nepetoideae tribe Ocimeae. It contains about 300 species and is most frequent in tropical and southern Africa and Madagascar, but also occurs in tropical Asia and Australia. There are 17 species known from Somalia. The Somali material, identified as *P. igniarius* (Schweinfurth) Agnew by the collectors, includes two anomalous specimens. When Morton (1998) described *P. gillettii* as a new species, he cited these two more or less leafless Somali specimens as paratypes, along with material from Ethiopia and Kenya. The Somali material is, however, geographically somewhat isolated from the rest of that species. Mats Thulin recently collected leafy, but otherwise very similar, plants from the same region in Somalia. The characteristic shape of the leaves, as well as other features of the plants, strongly suggests that these specimens are distinct from both *P. igniarius* and *P. gillettii* and belong to a different hitherto undescribed taxon. It is described here as a new species.

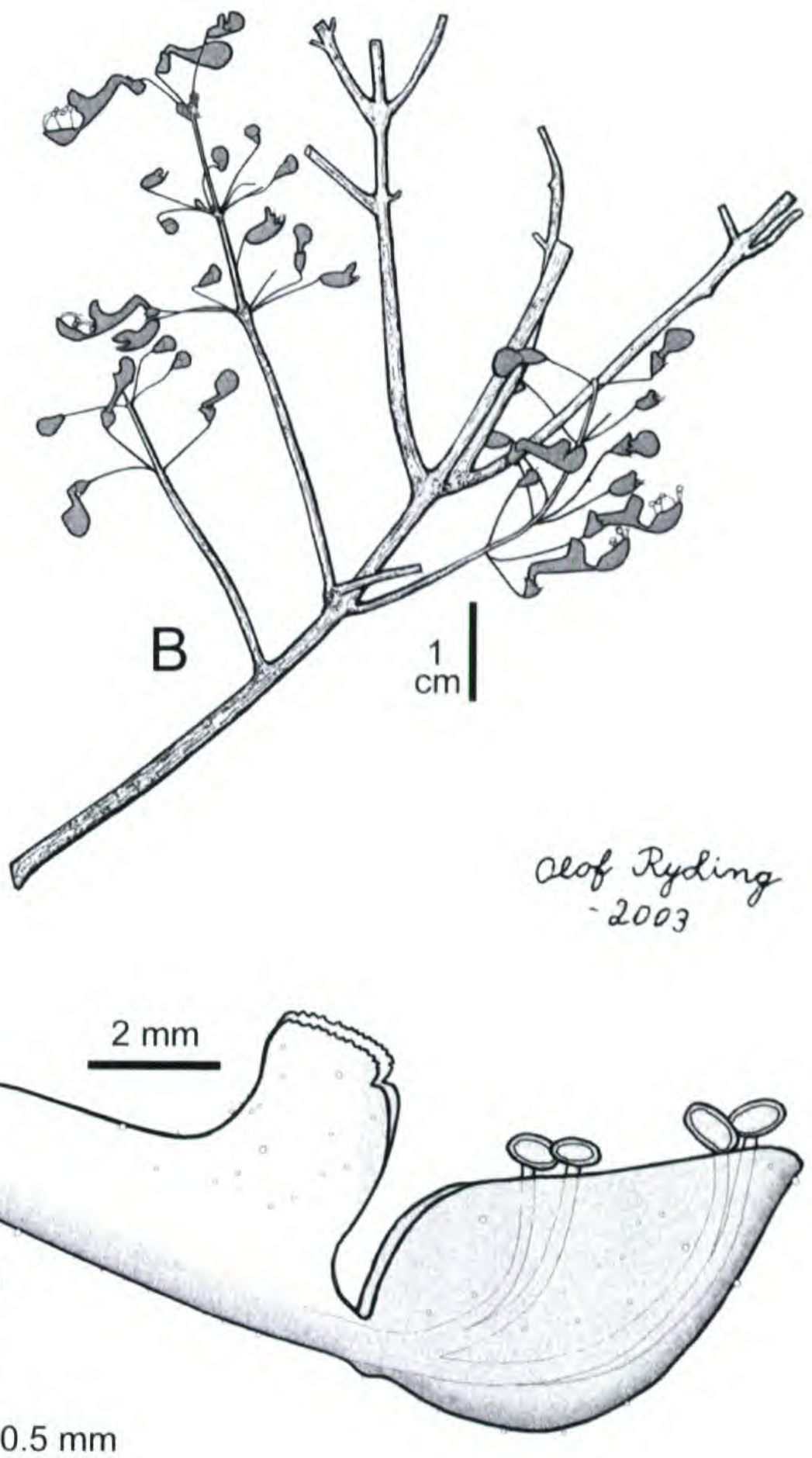
With the exclusion of the Somali collections in question, *P. gillettii* is more clearly delimited and is restricted to a more coherent distribution area in Ethiopia and Kenya. However, the modification of the circumscription hardly affects Morton's (1998) description of this species.

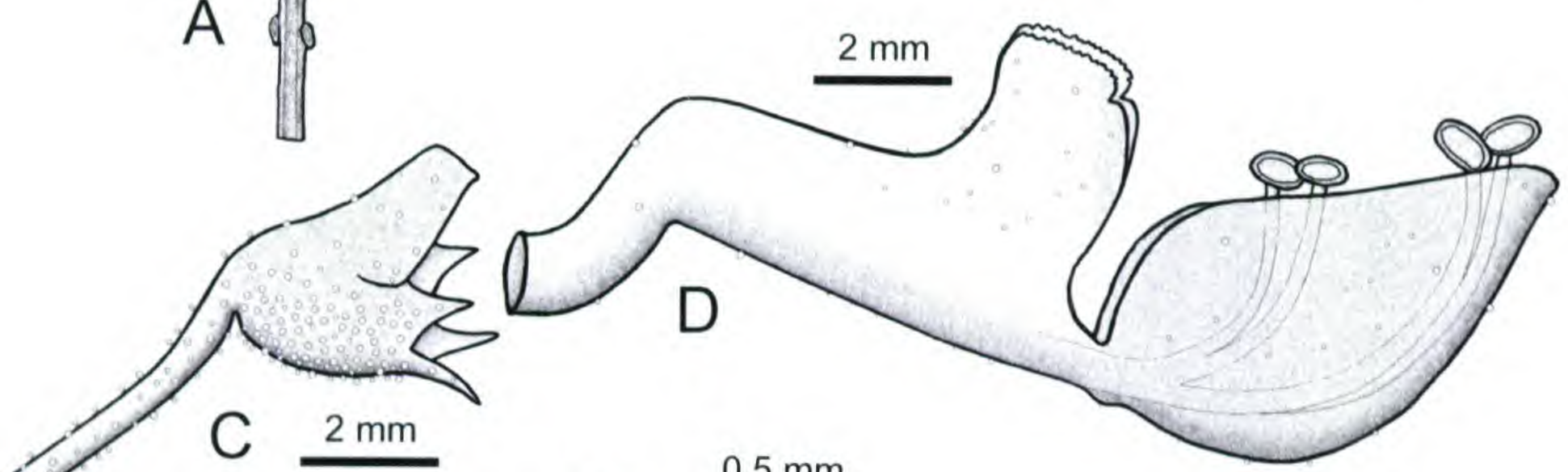
Plectranthus igniarioides Ryding, sp. nov. TYPE: Somalia. Sanaag Region: 43 km from Ceel Afweyn on road to Ceerigaabo, 10°16′N, 47°12′E, ca. 1480 m, 30 Jan. 2002, *M. Thulin 10768* (holotype, UPS, photos at C, MO; isotype, K). Figure 1.

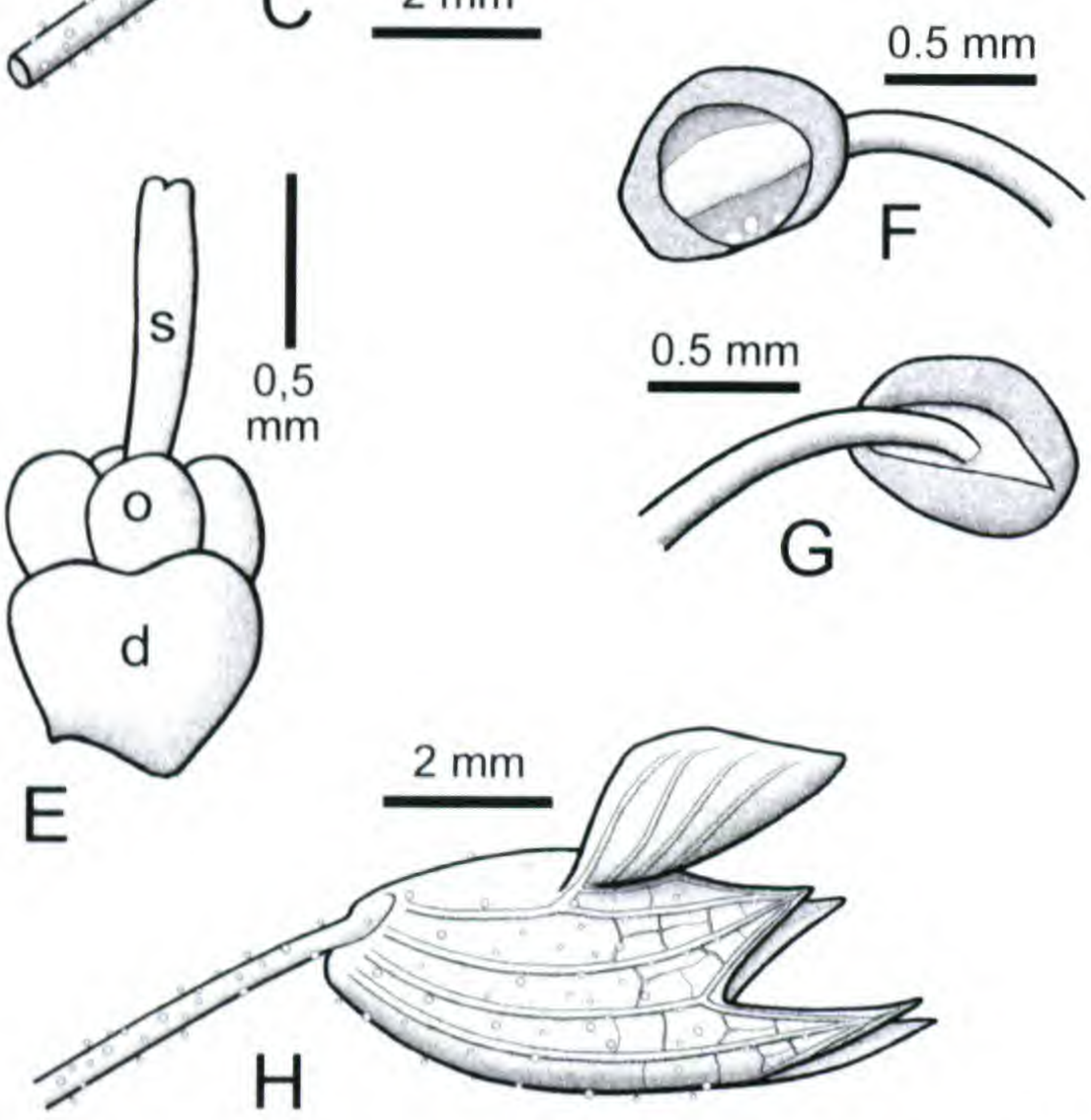
Differt ab aliis speciebus cognatis *Plectranthis* combinatione constanti ex foliis integris subsessilibus utrinque incanis plerumque deciduis sub anthesi, lobo supero calycis fructicantis cupulato, lobis centralibus labii superi corollarum fimbriis.

Shrublet, 0.4–2.5 m tall, strongly aromatic; young stems woody-fleshy, hoary; eglandular hairs 0.1–0.15 mm long, ± recurved, stalked glands slightly longer, sessile glands orange or colorless; old stems woody, bark gray. *Leaves* decussate, mostly deciduous before anthesis, elliptic, up to 33 × 15 mm, 1.7–2.8 times as long as broad, grayish, hoary especially below, with orange sessile glands on both surfaces; apex obtuse to subacute; base with decurrent margins, petiole up to 2 mm long; margin entire. *Inflorescences* thyrsoid, lax, verticillasters 2 to 6, simple, lateral branches short or apparently gathered into a branched thyrse; bracts ovate, acuminate to acute, cupular, 1–2 mm long, strongly orange-glandular, quickly deciduous; cymes 1- to 5-flowered, peduncle 0–1.5 mm long; pedicels 6–13 mm long, spreading, densely glandular with shortly stalked and larger orange to colorless subsessile glands. *Calyx* at anthesis 2–3.5 mm long, upper lobe violet and rather sparsely glandular, elsewhere violet or green, very densely glandular with shortly stalked and larger orange or colorless subsessile glands; *corolla* 2-lipped, 11–16 mm long, dark blue to purple; indumentum sparsely glandular and eglandular; tube base sigmoid, slightly widened toward the throat, prolonged at the insertion of the lower lip, 7.5–9 mm long; upper lip 4-lobed, mid-lobes much broader than the lateral lobes, subtruncate, minutely erose; lower lip much longer than the upper lip, 5–7 mm long, deeply boat-shaped, slightly darker than the rest of the corolla; *stamens* 4, shorter than the lower lip of the corolla during early anthesis, becoming longer than









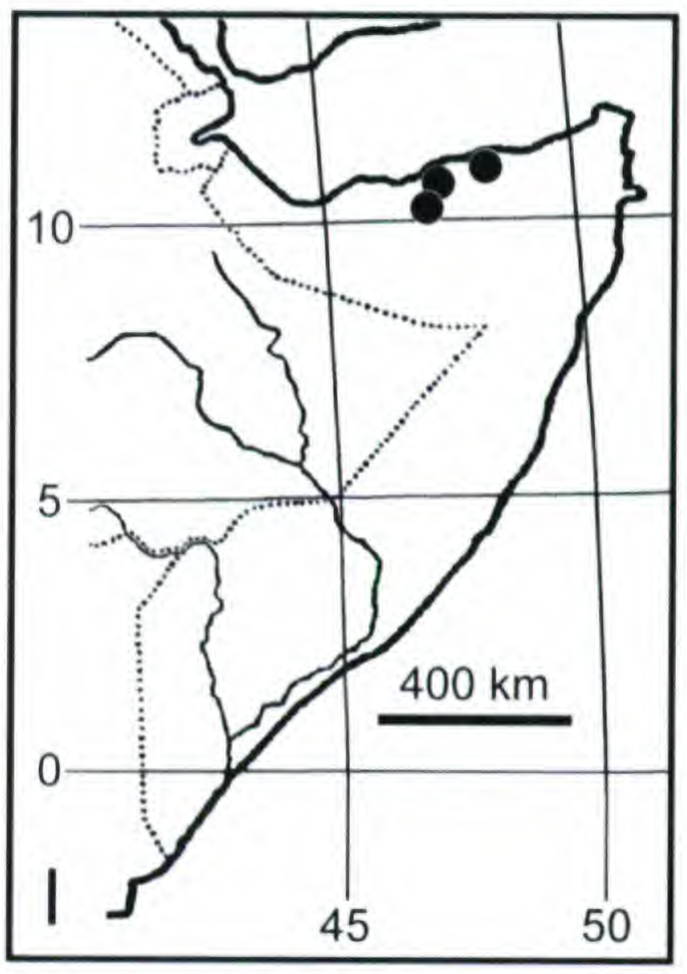


Figure 1. *Plectranthus igniarioides* Ryding. —A. Branch with leaves (the upper part of the specimen). —B. Branch with inflorescences. —C. Calyx at the anthesis. —D. Corolla at early anthesis with the stamens short. —E. Young gynoecium of a flower bud; s = style; o = ovary lobe; d = disc. —F. Anther of an anterior stamen seen from above. —G. The same anther seen from below. —H. Fruiting calyx. —I. Map of Somalia showing the known distribution of *P. igniarioides*. A–G drawn from *Thulin 10768* (UPS); H drawn from *Glover & Gilliland 642* (K).

the lower lip of the corolla, connate along 1–2 mm, anterior pair connation slightly longer; *anthers* becoming depressed at the back by the insertion of the filament, ± incurved at the opening; anthers of the posterior pair 0.6–0.8 mm diam.; anthers of anterior pair 0.7–0.9 mm diam.; pollen mass white; *style* exserted from the lower lip of the corolla, bifid; *disc* abaxial lobe slightly enlarged. *Fruiting calyx* enlarging to 7–8 mm long, less densely glandular than flower calyx, glabrous inside or sparsely glandular; pedicel insertion dorsal; upper lobe suborbicular to slightly oblate, apex acute, slightly mucronate, becoming cupular, margins shortly decurrent on the tube; lateral lobes 2, obliquely subtriangular, slightly shorter than the ventral lobes; ventral lobes 2, narrowly triangular, becoming 2–2.5 mm long; *nutlets* (immature?) obovoid, ca. 1.7 × 1.3 mm, smooth, grayish brown.

Distribution and habitat. Gypsum or limestone hills or on hillsides over volcanic rock; altitude 1450–1850 m. Sanaag Region in Somalia (Fig. 1I).

The connate stamens (Fig. 1D), deciduous bracts, and the absence of a ring of eglandular hairs in the calyx throat indicate that *P. igniarioides* belongs to the subgenus *Coleus* as defined by Codd (1975). The species is perhaps most closely related to *P. igniarius*, which it resembles in its entire deciduous leaves and minutely erose mid-lobes of the upper lip of the corolla. However, whereas *P. igniarius* has a unique calyx shape with a hooded upper lip and rather short and broad ventral lobes, *P. igniarioides* (Fig. 1H) resembles most other *Plectranthus* species in having the upper calyx lobe cupular and shortly decurrent along the tube and the two ventral lobes rather narrow. The species also differs from *P. igniarius* in having densely hoary, subsessile leaves. *Plectranthus igniarius* occurs in eastern and northeastern Africa including Somalia and on the Arabian Peninsula. *Plectranthus igniarioides* is perhaps also closely related to the other northeastern tropical African species that have a similar shrubby habit and deciduous leaves, as discussed above. In addition to lacking the characteristic leaf shape of *P. igniarioides*, *P. gillettii* differs in being less hairy with slightly longer hairs, in having the posterior stamens virtually free, and probably having a paler and partly white corolla with the tube more strongly widened toward the throat. *Plectranthus cuneatus* (E. G. Baker) Ryding and *P. bariensis* Ryding both differ from *P. igniarioides* in having shorter pedicels (2–7 mm long) and characteristic apically truncate or very broadly rounded leaves. *Plectranthus puberulentus* J. K. Morton differs from *P. igniarioides* in having the fruiting calyx slightly but distinctly hairy inside and the pedicels densely pubescent with short eglandular hairs.

Plectranthus igniarioides can be distinguished from most other *Plectranthus* in having entire leaves (Fig. 1A). Minutely erose mid-lobes of the upper corolla lip seem also to be a rare feature in the genus (Fig. 1D). Entire leaves, however, also occur in the Somali and Yemeni *P. argentifolius* Ryding. *Plectranthus igniarioides* differs from *P. argentifolius* and other species of *Plectranthus* subg. *Calceolanthus* in having the fruiting calyx almost glabrous inside, while the species of *Calceolanthus* have the calyx characteristically villous in the mouth. *Plectranthus igniarioides* also differs from *P. argentifolius* in being taller, woodier, and having longer pedicels.

Paratypes. SOMALIA. **Sanaag Region:** Mas Aled, 11°00′N, 48°20′E, 7 Aug. 1957, *Newbould 822A* (K with *P. igniarius* on the same sheet); at "Erigavo" (Ceerigaabo), 24 Jan. 1945, *Glover & Gilliland 642* (K).

Acknowledgments. Material was loaned from UPS and K, and material of the presumably related species was examined during visits to ETH, UPS, and K. I thank the directors and curators of these herbaria. I am also indebted to Mats Thulin at the University of Uppsala (Sweden) for informing me about the interesting plants collected during his journey in Somalia in 2002, and to the two reviewers, Peter Phillipson and Trevor Edwards (both South African), for valuable comments on the manuscript.

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Waltheria berteroi (Sterculiaceae, Hermannieae),[1] a New Combination from Colombia and Venezuela

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Abstract. A new combination in Sterculiaceae, Hermannieae, *Waltheria berteroi* (Sprengel) J. G. Saunders, is created and lectotypified. *Waltheria subcordata* Standley from Colombia and Venezuela is newly synonymized to *W. berteroi* on the basis of shared bract, leaf, and inflorescence characters. Additional isotypes of *W. subcordata* are newly cited for *Smith 493*, and further clarification of non-type *Smith 493* specimens is given. *Waltheria berteroi* has been confused with *W. lophanthus* J. R. & G. Forster from the South Pacific Ocean but differs in its leaf vestiture, leaf apices, stipules, bracts, thrum stamen tube, and stigma, as well as characters of the fruit and seed. Apparent morphological intermediates of *W. berteroi* with *W. glomerata* Presl or *W. involucrata* Bentham are noted to occur outside the Colombian Sierra Nevada de Santa Marta, western Eastern Cordillera, and Sahagun vicinities.

Key words: Colombia, Hermannieae, *Malachra*, Malvaceae, Marquesas Islands, Society Islands, Sterculiaceae, Venezuela, *Waltheria*.

A new combination is necessary for a primarily Colombian species now called *Waltheria subcordata* Standley (Sterculiaceae, Hermannieae). Sprengel earlier described a Bertero collection of the same species from Colombia as *Malachra berteroi* Sprengel [as "*berterii*"] in Malvaceae (1826: 94): "*M. caule fruticoso aspero tomentoso, foliis ovato-oblongis duplicato-dentatis supra stellato pubescentibus, subtus venoso-reticulatis tomentosis, racemis axillaribus, involucri foliolis cuneatis coloratis nervosis. Ad. fl. Magdalen., Bertero.*" According to Lanjouw and Stafleu (1954), Bertero collected in northern Colombia during 1820–1821; duplicates of these specimens can be found at B, HAL, L, MEDEL, MO, and S.

Garcke (1863), a curator at Halle (Stafleu & Cowan, 1976), apparently examined the type of *Malachra berteroi* (at that time at Halle, later transferred to B in 1890 (Stafleu & Cowan, 1985), now presumably lost) and concluded it was in complete agreement with Sprengel's original diagnosis. Moreover, he concurred with the determination by Balbis for a Bertero collection of the same plant (Berlin Herbarium specimen F photo 9568 and Garcke, 1863) that Bertero's collection was not a *Malachra* but a *Waltheria*. Whereas Balbis had designated the plant to be *W. lophanthus* J. R. & G. Forster auct. non Willdenow (Willdenow, 1800) [nom. illegit., ≡ *W. tomentosa* (J. R. & G. Forster) H. St. John; see *J. R. & G. Forster s.n.*, K, F Berlin Herbarium specimen-photo 9568 and MO Bernhardi Herbarium specimen 3261414], Garcke differed in the species determination, stating that *W. lophanthus* was a different species, but a valid combination was not made. Gürke (1892), following Garcke, excluded *M. berteroi* from *Malachra* but treated it as a synonym of *W. lophanthus* J. R. & G. Forster.

As Garcke (1863) pointed out, Balbis and later Gürke misidentified the Bertero specimens at the species level. *Waltheria tomentosa* is endemic to the Marquesas Islands and Society Islands of the southeastern Pacific Ocean and differs from Sprengel's species of Colombia. *Waltheria berteroi* is distinct from *W. tomentosa* by its overall vestiture, which is finely stellate-pubescent and shorter rather than woolly-pannose, stellate-tomentose; by its leaf blades, which are ovate, with acute to acuminate-acute apices, with rounded to narrowly cordate bases, and adaxially pubescent, abaxially tomentose, rather than widely to very widely ovate, with mostly obtuse-angled to obtuse-rounded apices, with cordate to deeply cordate bases, and canescent on both faces; by its stipules, which are narrowly triangular-subulate and compressed, rather than triangular and planar; by its less compact inflorescences; by its narrowly oblanceolate or obovate-spathulate bracts rather than narrowly triangular-subulate bracts; by its longer thrum stamen filament tube to 1.5(2.0) mm rather than 0.7(0.9)

[1] Hermannieae including *Waltheria*, formerly in Sterculiaceae, is now placed in the Byttnerioideae basal to Grewioideae, formerly in Tiliaceae, in an expanded Malvaceae s.l. (Bayer & Kubitzki, 2003).

mm long; by its more distended-plumose stigma; by its pubescent rather than sericeous capsule; and by its longer seed to 2.5 mm rather than to 2.2 mm long (cf. Saunders, 1995: 330–337, 780–793). The Colombian species was validly described as *Waltheria subcordata* by Standley (1916), who was unaware of the earlier name, based upon another type. However, both types are conspecific, sharing the distinctive loosely condensed inflorescences, showy mostly distinct obovate bracts with obtuse apices and cuneate bases, and leaf shapes.

Garcke (1863) noted that Sprengel erroneously cited the provenance of the Bertero collection as coming from the Río Magdalena. The labels of both Sprengel's sheet (*Bertero s.n.*) and the duplicate annotated by Balbis at B indicated "S. Marthe" (Santa Marta, Colombia) with labels in Balbis's handwriting (verified by reference samples in Burdet, 1972). It is easy to understand the confusion about specific locality data. The Bertero collections appear to have been distributed without attached original label data, as the only early labels on the F isotype photo and MO specimen are in Balbis's own handwriting bearing "S. Marthe," written between 1820 and 1821 (probable collection dates of Bertero's Colombian collections listed in Lanjouw & Stafleu, 1954) and 1831, the date of Balbis's and Bertero's deaths (Stafleu & Cowan, 1976). Balbis moved to Lyon in 1814 from Torino (Stafleu & Mennega, 1992), and apparently visited the Berlin herbarium during the period between 1820 and 1831, probably 1824, as noted, but illegibly, by Kunth on the Berlin duplicate (see F 9568, photo of B isotype [destroyed]). The source for Sprengel's locality information or even Balbis's locality notations is elusive. Presumably, one or the other was in correspondence with Bertero, or had access to knowledge obtained about the localities. An asterisk in Sprengel's (1826) original description indicates living material was studied, so perhaps separate horticultural records account for the discrepancy in localities. The Magdalena River empties into the ocean about 120 km southwest of the present city limits of Santa Marta in the Dpto. Magdalena in Colombia, but is near to the general locality that appears to have been broadly designated as Santa Marta by early collectors.

Waltheria berteroi (Sprengel) J. G. Saunders, comb. nov. Basionym: *Malachra berteroi* Sprengel [as "berterii"], Syst. Veg. 3: 94. 1826. TYPE: Colombia. Santa Marta, 1820–1821, *[C. G.] Bertero s.n.* (lectotype, designated here, MO 3261414; isotypes, F 9568, photo of B isotype destroyed).

Waltheria subcordata Standley, Contr. U.S. Natl. Herb. 18: 117. 1916. Syn. nov. TYPE: Colombia. Masinga, 500 ft., 25 Oct. 1898–1901, *H. H. Smith 493* (holotype, US 533011; isotypes, A, E, F, MO, MPU, NY, S).

Distribution, habitat, and phenology. Northern and eastern Colombia (Atlántico, Magdalena, Bolívar, César, Santander, La Guajira, Vichada) and northwestern and central Venezuela (Falcón, Zulia, Apure, Amazonas, Bolívar). It is mostly and best represented (*W. berteroi* s. str.) from Colombia in and below the western Sierra Nevada de Santa Marta, up to 1600 m, along the western Eastern Cordillera, and near Sahagun. Elsewhere in Colombia (Magdalena River mouth to Baranoa; El Cerrejón) and Venezuela it is less representative (*W. berteroi* s.l.) with intermediate forms (see below) particularly near the middle Orinoco River from Samariapo to San Vicente. Shrubs to 3 m in tropical savannas in openings or borders of dry forest, along rivers or streams, roadsides, or in foothills, occurring from 10 to 1613 m elevation. Flowering October through March, peaking in December and January, with flowers presumably diurnal.

Additional isotypes of *Waltheria berteroi* have been sought at L (absent), MEDEL, and S, because Bertero's Colombian collections are there (Lanjouw & Stafleu, 1954). They were not sought at HAL, as Sprengels's herbarium at HAL was transferred to Berlin (Stafleu & Cowan, 1985).

Additional conspecific collections given the same number (*Smith 493*, LL, MICH, NY, U, WIS) but from a different locality in Magdalena at Bonda, 250 ft., on a different date, 13 May, are excluded from the type of *Waltheria subcordata* and noted below in specimens examined. Ayers and Boufford (1988) discussed the common assignment of the same collection number from different localities and dates for presumably conspecific plants in Smith collections and established that his collection data exist on NY material in most cases. Isotypes for *W. subcordata* from E, MPU, and S supplement those listed there. The non-type collections of *Smith 493* can be readily identified upon comparison with the NY non-type specimen that bears a handwritten collection label stating "Bonda." The non-type specimens also differ by their smaller leaves, thrum rather than pin flowers, and aspect of more arid growing conditions. As Standley (1916) noted, *Smith 493* duplicates were distributed from NY as *W. involucrata* Bentham, "narrow bracted form."

Riedlea berteriana Balbis ex DC., a synonym of *Waltheria glabra* Poiret, is a similar epithet to *berteroi*, but would not be considered a homonym (ICBN, Art. 53.3 ex. 10, Greuter et al., 2000).

Specimens that in my opinion are representative of *Waltheria berteroi* s. str. are cited below. Other Colombian populations of *Waltheria berteroi* s.l. from the departments of Atlántico (e.g., *Dugand & Jaramillo 4034*, US; *Elias 195*, F), and Guajira (e.g., *Bunch et al. s.n.*, MO), and Venezuelan populations from Falcón (e.g., *Wingfield 6009*, CTES) and Zulia (e.g., *Nucette 164*, CTES) appear to be morphologically intermediate with *W. glomerata* Presl by their compact, glomerate inflorescences and smaller bracts. *Waltheria glomerata*, from Meta, Guaviare, Boyacá, and Uribe in Colombia, and Panama to Mexico, otherwise differs by its white petals, its leaves often elliptical or rhombic, later rugose, and its differently shaped bracteoles and bracts, with more fusion. In contrast, the middle Orinocan River-associated Venezuelan populations of *W. berteroi* s.l. from Amazonas (e.g., *Gröger & Barcroft 295*, MO; *Stergios 3170*, CTES), Apure, and Bolívar (e.g., *Amyard & Stergios 3340*, MO; *Trujillo 11785*, MY), and the Colombian ones from Vichada appear to be morphologically intermediate with *W. involucrata* (Saunders, 1995: 49, 335–337, 575–589). All intermediate populations associated with the lower Orinoco River are placed with *W. involucrata* s.l., occurring only east of the Caroní River but not known between the Chaviripa River and west of the Caroní River, where non-intermediate *W. involucrata* s. str. occurs. Their bracts are wider, more elliptically or rhombicly but variably shaped, sometimes with the middle two or three slightly to mostly fused rather than mostly distinct, with margins irregular, serrulate, undulate, or partly entire rather than entire. When bracts are together cupuliform as in *W. involucrata*, but 4-shallowly lobed and 1-parted, as occurs near the lower rather than middle Orinoco River in the Venezuelan departments of Bolívar, east of Río Caroní, and in Delta Amacuro, the intermediates are unequivocally placed with *W. involucrata*. *Waltheria berteroi* s. str. differs from *W. involucrata* s. str. in non-intermediate populations by its essentially distinct bracts that are spathulate, with margins generally entire, rather than entirely fused bracts that are urceolate, with lobes that are 1–1.7 mm long, and dentate; by its calyx lobes that are (1.2)1.6–1.9 mm wide rather than 1.1–1.5(1.6) mm wide; and by its anthers that are 0.8–1.0(1.2) mm long rather than (1.0)1.1–1.5 mm long. Also, usually the calyx tube of *W. berteroi* is shorter, 3.5–4.2 mm long, rather than (3.0)4.0–6.0 mm long as in *W. involucrata*.

Selected specimens. COLOMBIA. **Cordoba:** Sahagun, 27 Jan. 1918, *Pennell 4085* (NY). **César:** Mpio. Valledupar, Inspección a Atanquez, entre Atanquez y Guatapuré, 18 Nov. 1968, *Jones & Pinto 2856* (NY); Poponte, Magdalena Valley, 8 Dec. 1924, *Allen 826* (MO). **Magdalena:** Minca, 1941, *Bro. Apolinar 528* (US); Cincinati, 1932, *Giacometto 111* (US); Ocana, 11 Dec. 1879, *Kalbreyer 1266* (K); Sta. Marta, Uranieta, Valle de Alpar, *Karsten s.n.* (W); Sta. Marta, *Purdie s.n.* (K); Camino de La Gran Vía a San Pedro, *Romero-Castañeda 10644* (F, MO, NY); Tucurinca, Oct. 1947, *Romero-Castañeda 614* (F, US); La Bonda, 250 ft., 13 May 1898–1901, *H. H. Smith 493* locale & date differ from type for *W. subcordata* (LL, MICH, NY, U, WIS). **Santander:** Bucaramanga & vic., 29 Dec. 1926, *Killip & Smith 16251* (A, F, GH, NY).

Acknowledgments. I thank Carmen Cristóbal and Antonio Krapovickas for bringing the nomenclatural problem to my attention, providing an analysis, bibliographic materials, and for reading the manuscript; Lindsay Woodruff for sending a copy of Gürke's article; and K. Herbst, Mahinda Martínez, and Marguerite Elliot for the translation of Garcke's article. I am grateful to Fred Barrie for nomenclatural advice, for review, and for rewriting portions of the later versions of the paper, and also to Beryl Simpson, Billie Turner, Guy Nesom, Javier Fuertes, Fernando Zuloaga, Roberto Kiesling, Osvaldo Morrone, and Victoria Hollowell for nomenclatural or other helpful comments and review of earlier or later drafts. Partial financial support for a larger monographic revision that included this study was provided by a National Science Foundation-DIS grant (BSR-8800899) and various fellowship awards from the University of Texas at Austin. I am grateful to the curators and directors of A, CTES, E, F, GH, K, LL, MEDEL, MICH, MO, MPU, MY, NY, S, US, W, and WIS for the loan of specimens cited here, and to staff at L, MEDEL, and S for searching for additional isotypes.

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New Species of *Ocotea* (Lauraceae) from Northern Peru and Ecuador

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ABSTRACT. Seven species of *Ocotea*, collected during fieldwork in the drainage of the Río Cenepa in northern Peru, are described. They will be included in the forthcoming *Flora del Río Cenepa*. The new species are: *Ocotea badia* van der Werff, *Ocotea hirtandra* van der Werff, *Ocotea imazensis* van der Werff, *Ocotea laevifolia* van der Werff, *Ocotea lenitae* van der Werff, *Ocotea leptophylla* van der Werff, and *Ocotea vasquezii* van der Werff.

Key words: Ecuador, Lauraceae, *Ocotea*, Peru, Río Cenepa.

During preparation of a treatment of the Lauraceae for the *Flora del Río Cenepa* (Vasquez et al., in prep.) a number of collections were encountered that defied attempts at identification. Three species, belonging to the better known genera *Licaria* Aublet, *Nectandra* Rottboell, and *Pleurothyrium* Nees, were described in an earlier publication (van der Werff, 2003), but those belonging to the large and difficult genus *Ocotea* Aublet had not been dealt with. Based on these collections from northern Peru and adjacent Ecuador, seven new species are described here. *Ocotea* is the largest genus of Lauraceae in the Neotropics, with an estimated 300+ species (pers. obs.). It was last revised by Mez (1889), who included 199 species in the genus. Since then, a steady stream of new species has been published (van der Werff, 1994, 1999, 2001, 2003; van der Werff & Vicentini, 2000). Rohwer (1986) published an overview of the genus, largely based on a study of type specimens. He recognized a number of species groups and provided keys to his species groups and to species within each species group. His contribution has greatly helped our understanding of the genus. Traditionally, *Ocotea* has been characterized by having flowers with nine 4-celled locelli, the locelli arranged in two superposed pairs, and includes all species that do not fit in other, better defined genera with nine 4-celled stamens. A DNA-based phylogeny of the genera of Lauraceae (Chanderbali et al., 2001) suggests strongly that *Ocotea* as currently accepted is not a monophyletic genus, but is formed by several not closely related groups of species. These new insights have not yet been incorporated in a new classification, largely because morphological characters that would support the groups recognized in the DNA-based phylogeny have not yet been found. A first step toward a new classification of *Ocotea* will be a revision of the known species and the description of the assorted undescribed species. Such a revision is planned by the author. Until such a revision has been completed, I will use the traditional concept for *Ocotea*, even though it is very likely too broad.

The new species discovered in northern Peru are the following:

1. **Ocotea badia** van der Werff, sp. nov. TYPE: Peru. Depto. Amazonas: Bagua Prov., Distr. Imaza, Yamayakat, 04°55′S, 78°19′W, 400 m alt., 24 May 1996 (fl), *R. Vasquez & A. Vasquez 20957* (holotype, HUT; isotypes, HBG, K, MO, NY, USM). Figure 1.

Ex grege Ocoteae minarum, sed ramulis tomentellis, venatione partim brochidodroma et foliis subtus pilis erectis praeditis differt.

Trees, to 25 m; young twigs angular, solid or older twigs narrowly fistulose, densely reddish brown tomentellous, the indument covering the surface completely, becoming glabrous with age; terminal buds densely reddish brown tomentellous. Leaves 10–18 × 3–5 cm, elliptic to slightly obovate, chartaceous, alternate, the base acute, the margin flat, the apex acuminate, acumen to 1.5 cm long; venation immersed on upper surface, raised on lower surface; upper surface glabrous, lower surface initially densely pubescent with short, erect hairs, the indument becoming sparser with age, midrib and lateral veins tomentellous on the lower surface; domatia lacking; lateral veins 4 to 7 pairs, often somewhat loop-connected in the distal half; petioles flat above. Inflorescences to 12 cm long, paniculate-cymose, reddish brown tomentellous, in the axils of leaves or cataphylls. Flowers hermaphrodite, yellow, 2.5–3.5 mm diam., the tepals erect at anthesis, pedicels 2–3 mm long; tepals 6, 1.5 mm

long, ovate-elliptic, moderately pubescent outside, sparsely pubescent inside; stamens 9, all 4-celled, the cells in 2 superposed pairs, the outer 6 ca. 1.2 mm long, the glabrous anther ca. 1 mm long, the short filament pubescent; inner stamens same length, also with a very short filament, glands present at the base of the inner stamens, staminodia not seen, pistil glabrous, ca. 1.6 mm long, the style 1 mm long, the ovary globose, clearly swollen. Fruits ellipsoid to ovoid-ellipsoid, 2 × 1 cm, cupule small, platelike, 6 mm diam., gradually narrowed into the pedicel.

Ocotea badia, named after the color of the indument on the young twigs, is close to the O. minarum group or part of it, largely because of its ellipsoid or ovoid-ellipsoid fruits and small, platelike cupules. Rohwer (1986) found two types of flowers in this group: pistillate and hermaphrodite. The type of *O. badia* has hermaphrodite flowers: the pistil has a clearly thickened ovary, while the locelli of the stamens open and show some pollen grains on their flaps. However, the terminal buds are not as long and slender as is usual in this group. The only species in the O. minarum group or close to it that have an erect indument are *O. fendleri* (Meisner) Rohwer, *O. ovalifolia* (Ruiz & Pavón) Mez, *O. scalariformis* van der Werff, and *O. odorata* (Meisner) Mez, but the first three of these species have attenuate leaf bases that are usually inrolled and *O. odorata* differs in having the lower leaf surface glaucous. Some of the flowers and buds of the type collection are larger than average for the species, and have a denser indument and longer pedicels. These buds or flowers are diseased and contain only whorls of gradually reduced tepals, but no reproductive organs. The tertiary venation on the lower leaf surface of *O. badia* is noticably less raised on the fruiting specimens than on the flowering ones, but the leaf shape, indument, and the partly loop-connected venation are similar in fruiting and flowering specimens. The Ecuadorian paratype is placed here provisionally: it differs in having smaller leaves, shorter petioles, more pairs of lateral veins and lacks the loop-connected venation in the distal half of the leaves.

Phenology. Flowering May–June; fruiting February.

Paratypes. ECUADOR. **Carchi:** Tulcan Canton, Reserva Ethnica Awa-Camumbi (fr), *C. Quelal, C. Aulestia & F. Nastacuaz 255* (MO). PERU. **Amazonas:** Río Cenepa, S of Huampami trail (fr), *B. Berlin 1662* (MO); Quebrada Huampami (fr), *R. Kayap 363* (MO); Condorcanqui Province, El Cenepa, comunidad de San Antonio (fl), *R. Vasquez, A. Peña, E. Chavez & E. Quiaco 24088* (MO).

2. Ocotea hirtandra van der Werff, sp. nov. TYPE: Peru. Depto. Amazonas: Bagua Prov., Distr. Imaza, camino Putuim–Shimutaz, 05°03′S, 78°20′W, 380 m, 22 June 1996 (fl), *R. Vasquez, A. Vasquez, L. Dekentai & M. Chuimtan 21335* (holotype, HUT; isotypes, HBG, MO, NY). Figure 2.

Ocoteae multiglandulosae similis, sed staminibus dense pubescentibus et pistillodio glabro recedit.

Trees, to 30 m; twigs angular or ridged, glabrous or near the tips minutely appressed pubescent, solid, terminal buds densely appressed pubescent. Leaves alternate, 10–21 × 4–8 cm, chartaceous, obovate or obovate-elliptic, the base acute, margin flat or slightly inrolled, apex obtuse to bluntly acute, glabrous, except for the tufts of hairs in the axils of the basal lateral veins, venation immersed on the upper surface, midrib and lateral veins raised, tertiary venation immersed on the lower surface, petioles 10–15 mm, ridged; lateral veins 7 to 10 pairs. Inflorescences 8–15 cm, paniculate-cymose, in the axils of cataphylls near the tips of the branches, basally nearly glabrous, becoming distally moderately to densely puberulous with very short, erect hairs. Staminate flowers 3.5–4 mm diam., yellowish, pedicels densely puberulous, half as long to about as long as the flowers; tepals 1.5–2 mm long, densely puberulous on both surfaces, half-erect at anthesis, equal; stamens 9, all 4-celled, the cells in 2 superposed pairs, the outer 6 stamens with the cells introrse, 1.5 mm long, the filament half as long as the anther, filaments densely puberulous, the anther abaxially densely puberulous or the indument dense along the center of the anther and less dense toward the margins; inner 3 with the lower pair of cells extrorse, the upper pair latrorse, about as long as the outer 6 stamens, filaments densely puberulous and with 2 conspicuous glands at the base; staminodia present, ca. 0.5 mm long, stipitiform or with a capitate tip, puberulous, sometimes 2 locelli present on the staminodia; pistillode spindle-shaped, 1 mm long, glabrous; receptacle cup-shaped, glabrous inside; pistillate flowers and fruits not known.

Ocotea hirtandra is characterized by its densely puberulous flowers and stamens and its obovate or obovate-elliptic leaves with axillary tufts of hairs. The position of the inflorescences, in the axils of cataphylls and not in the axils of leaves, is unusual. In one of the five known collections (*Palacios & Iguago 4639*) the inflorescences are not subapical; here the terminal buds have produced a young shoot with immature leaves and the inflorescences are lower on the twig, but still not in the axils of leaves.

Figure 1. *Ocotea badia* van der Werff, the MO isotype, *Vasquez & Vasquez 20957.*

Relationships of the new species are not clear. It resembles species such as *O. multiglandulosa* (Ruiz & Pavón) Mez and *O. cuneifolia* (Ruiz & Pavón) Mez. The position of the inflorescences is unusual in the genus, as are the densely puberulous stamens. Mature cupules would help in understanding its position in the genus. In one collection (*Kayap 972*) the pistillode is swollen at the base, suggesting a viable pistil, but the anthers are normally developed, possess a few pollen grains, and the thickened pistillode does not possess a stigma and is clearly shorter than the inner 3 stamens. It is possible that this species is androdioecious, having staminate and hermaphrodite flowers, but more collections are needed to confirm this. Gynodioecious flowers have been reported in *Ocotea*, but androdioecious flowers are not definitely known in Lauraceae; Chanderbali (2004) suggested the presence of androdioecious flowers in *Endlicheria gracilis* Kostermans.

Phenology. Flowering June (Peruvian collections), October (Ecuadorian collections).

Paratypes. PERU. **Depto. Amazonas:** Prov. Condorcanqui, comunidad de Tutino (fl), *R. Vasquez, A. Peña, E. Chavez & E. Quiaco 24177* (MO); Lugar Huampami (fl), *R. Kayap 972* (MO). ECUADOR. **Napo:** Canton Archidona, Carretera Hollín–Loreto, entre Huamani y el Río Pucuno (fl), *W. Palacios & C. Iguago 4639* (MO); km 50 Carretera Hollín–Loreto (fl), *W. Palacios & C. Iguago 4621* (MO).

3. Ocotea imazensis van der Werff, sp. nov. TYPE: Peru. Depto. Amazonas: Bagua Prov., Distr. Imaza, Comunidad de Kampaenza, Ribera de la Quebrada Shimutaz, 05°55′S, 78°19′W, 320 m, 23 Sep. 1994 (fl, immature fr), *N. Jaramillo, R. Apanu & S. Katip 477* (holotype, HUT; isotypes, HBG, K, MO, NY, USM). Figure 3.

Figure 2. *Ocotea hirtandra* van der Werff, the MO isotype, *Vasquez et al. 21335.*

A congeneris ramulis inflorescentiisque dense tomentellis, basibus foliorum parum decurrentibus, petiolis supra complanatis et floribus hermaphroditis recedit.

Trees, to 25 m; twigs terete or angular, densely ferrugineous-tomentellous, the surface completely covered, solid; terminal buds densely tomentellous. Leaves 7–10 × 3–7 cm, firmly chartaceous, evenly distributed along the twigs, green above, with small wax deposits on the lower surface, glabrous on upper surface, with scattered curled hairs, these appressed or half-erect, on the lower surface the hairs denser and becoming tomentellous on the major veins; domatia lacking; apex acute or shortly acuminate, the base acute, the lamina slightly decurrent on the petioles; lateral veins 5 to 7 pairs; petioles brown-tomentellous, 8–14 mm long, flat above. Inflorescences 2.5–5 cm long, densely tomentellous, in the axils of leaves or bracts, paniculate-cymose, the lateral branches ending in a cyme, or racemose. Flowers yellow or cream-colored, hermaphrodite, ca. 3 mm diam., the pedicels less than the diameter of the flowers; tepals 1.3 mm long, spreading at anthesis, elliptic-oblong, densely pubescent on the outer surface, slightly less so on the inner surface; stamens 9, all 4-celled, glabrous, the outer 6 ca. 0.5 mm long, the filament shorter than the anther, opening introrse, the cells arranged in 2 pairs, inner 3 stamens of same size, the lower 2 anther cells extrorse, the upper 2 lateral, glands present at the base of the inner 3 stamens, staminodia present, columnar, with a slightly thickened apex, glabrous, about as long as the filaments of the inner stamens; pistil glabrous, style distinct, ca. 0.2 mm long. Immature fruit enclosed in the hypanthium; 1 older cupule 7 mm diam., 5 mm high, weakly double-margined, the outer margin erect and sur-

Figure 3. *Ocotea imazensis* van der Werff, the MO isotype, *Jaramillo et al. 477.*

passing the inner margin; fruit (possibly immature) 9 × 4 mm; tepals deciduous in fruit.

Ocotea imazensis is best recognized by the combination of densely pubescent twigs and inflorescences, the slightly decurrent leaf base, the flat petioles, and perfect flowers. The new species does not seem to be closely related to any of the other *Ocotea* species with perfect flowers in South America. Vegetatively it resembles a collection from the Arboretum Jenaro Herrera in the Departamento de Loreto (*Chota s.n.* collected from tree 3/96, MO), but that specimen has larger flowers with pubescent stamens; it has not yet been identified.

Phenology. Flowering September.

Paratype. PERU. **Depto. Amazonas:** Bagua Prov., Distr. Imaza, Comunidad Aguaruna Pituim (fl), *C. Diaz, A. Peña & P. Atamain 7208* (MO).

4. Ocotea laevifolia van der Werff, sp. nov. TYPE: Peru. Depto. Amazonas: Prov. Bagua, Distr. Imaza, Tayu Mujaji, 05°15′56″S, 78°22′07″W, 1200 m, 21 Oct. 1997 (fl), *R. Vasquez, J. Lirio & G. Pitug 24603* (holotype, HUT; isotypes, HBG, MO). Figure 4.

Ex grege Ocoteae aciphyllae, sed foliis laevibus, inflorescentiis laxis et habitu fruticoso recedit.

Shrub, 2 m tall; twigs terete or ridged, near the tip minutely appressed pubescent, soon becoming glabrous, solid; terminal buds small, densely appressed pubescent. Leaves 9–14 × 3.5–5.5 cm, elliptic or ovate-elliptic, alternate, evenly distributed along the twigs, chartaceous, brittle, glabrous on both surfaces or minutely appressed pubescent on young leaves, the base obtuse, slightly inrolled, the apex acuminate or acute, venation on upper surface

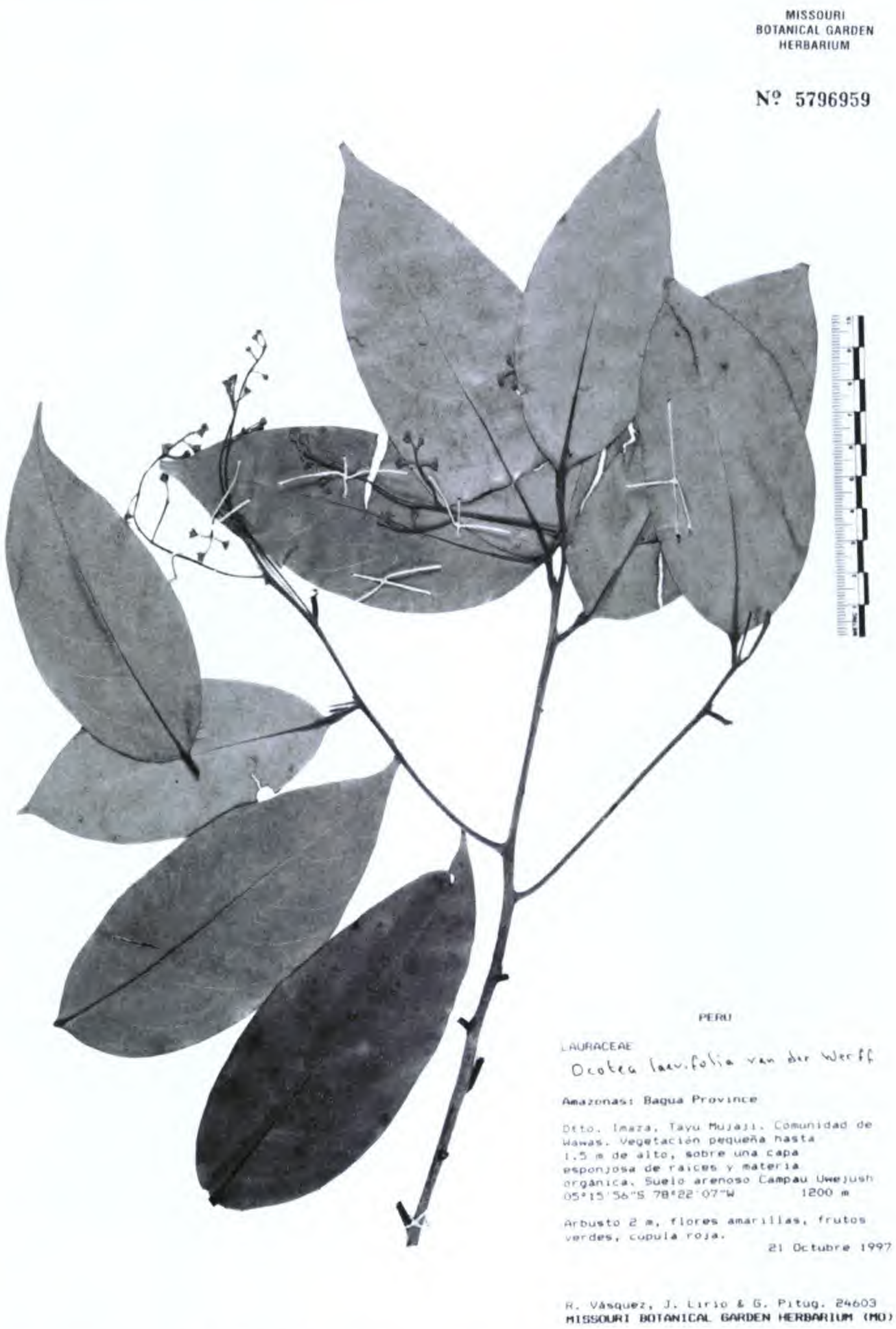

Figure 4. *Ocotea laevifolia* van der Werff, the MO isotype, *Vasquez et al. 24603.*

immersed, midrib slightly raised, otherwise venation immersed on lower surface, lateral veins difficult to discern, 6 to 8 pairs; petioles 7–10 mm long, canaliculate, minutely appressed pubescent or glabrous. Inflorescences 5–7 cm long, in the axils of leaves, laxly flowered, paniculate near the base, racemose more distally, moderately appressed pubescent, the indument denser toward the flowers. Flowers hermaphrodite, 3–3.5 mm diam., yellow, appressed pubescent, pedicels 3–5 mm long, densely appressed pubescent; tepals ca. 1.5 mm long, ovate-elliptic, appressed pubescent on both surfaces, half-erect at anthesis; stamens 9, all 4-celled, the cells in 2 superposed pairs, 1.2 mm long, the filaments a little shorter than the anthers, filaments pubescent, outer 6 stamens with the cells introrse, inner 3 with the cells lateral-extrorse, glands present at the base of the inner stamens, staminodia not seen, pistil 1.5 mm, glabrous, style slightly shorter than the ovary; receptacle cup-shaped, densely pubescent inside. Fruits and cupules not seen.

Ocotea laevifolia is only known from the type collection, made in the summit area of Cerro Tayu, at an altitude of about 1200 m. Cerro Tayu is an isolated sandstone hill with forested slopes and a summit area covered with 2 m tall scrub. Several other collections from Cerro Tayu are identified as undescribed species (representing two species of *Cyathea* in Cyatheaceae, one other species of *Ocotea*, and one species of *Phyllanthus*, Euphorbiaceae) or are new records for Peru (*Aratitiyopea lopezii* (L. B. Smith) Steyermark & Berry, Xyridaceae, and *Euceraea nitida* Martius, Flacourtiaceae). It is likely that more novelties will be found with further collecting on this rather small hill.

Ocotea species with hermaphrodite flowers in

Figure 5. *Ocotea lenitae* van der Werff, the MO isotype, *van der Werff et al. 16546.*

South America tend to belong to a few species groups, such as the O. insularis group, the O. aciphylla group, the O. sodiroana group, and the O. indecora group. The strongly canaliculate petioles point to the O. aciphylla group, while distinctive characters of the other groups are lacking. Its closest relative may be an undescribed species from the Cordillera del Condor in Ecuador, which differs in having thinner, subopposite leaves with an inrolled and decurrent leaf base. The two species share laxly flowered inflorescences and a pubescent inner surface of the receptacles.

5. Ocotea lenitae van der Werff, sp. nov. TYPE: Peru. Depto. de San Martín: Rioja Prov., along road Yorongos–La Florida near Rioja, 1000 m, 31 Mar. 2001 (hermaphrodite fl), *H. van der Werff, R. Vasquez, B. Gray & J. Campos 16546* (holotype, HUT; isotypes, CANB, HBG, K, MO, NY, US, USM). Figure 5.

Ex grege Ocoteae minarum, sed foliis obtusis, tepalis intus dense pubescentibus et fructibus globosis bene distincta.

Trees, to 45 m; twigs angled, moderately to sparsely appressed pubescent, becoming glabrous with age; terminal buds slender, densely appressed pubescent. Leaves 10–18 × 3–7 cm, alternate, evenly distributed along twigs, firmly chartaceous, obovate, the base narrowly cuneate, the margin flat or slightly inrolled, the apex obtuse, the upper surface glabrous, lower surface glabrous or with some appressed hairs, a few pit-domatia sometimes, but not always, present in the axils of lateral veins and visible as bumps on the upper surface, the margins of the pits glabrous; venation immersed on the upper surface, midrib and lateral veins raised on the lower surface; lateral veins 7 to 9 pairs; petioles 1–2 cm long, shallowly canaliculate. Inflorescences 5–15 cm long, paniculate-cymose, sparsely to mod-

Figure 6. *Ocotea leptophylla* van der Werff, the MO isotype, *Diaz et al. 8076*.

erately appressed pubescent, in the axils of leaves or cataphylls; hermaphrodite flowers ca. 5 mm diam., pistillate flowers ca. 4 mm diam., yellow or green, pedicels ca. 2 mm long. Hermaphrodite flowers: tepals ca. 1.7 mm long, elliptic, spreading at anthesis, the outer three sparsely appressed pubescent on the outer surface, the inner more densely so; inner surface of tepals densely pubescent; stamens 9, all 4-celled, the cells in 2 superposed pairs, the outer 6 stamens 1.3 mm long, the filaments ca. 0.3 mm long, pubescent, the anthers 1 mm long, glabrous, opening introrse; inner 3 stamens 1.5 mm long, the filaments pubescent, ca. 0.5 mm long, the anthers glabrous; globose glands present at the base of the inner stamens; staminodia lacking; pistil 1.5 mm long, glabrous, the style ca. 1 mm long, the stigma discoid, receptacle shallow, glabrous inside. Pistillate flowers: tepals 1.5 mm long, staminodia 9, ca. 0.6 mm long, the filaments very short, pubescent, glands present at the base of the inner staminodia, pistil 1.6 mm long, glabrous, the style a little longer than the ovary; receptacle shallowly cup-shaped, with some appressed hairs inside. Infructescences branching under almost 90°. Fruit globose, 1 cm diam., cupule small, platelike, 7 mm diam., pedicel and cupule lenticellate.

Ocotea lenitae belongs to the Ocotea minarum group based on its hermaphrodite and pistillate flowers and its platelike, lenticellate cupule. It is distinct within this group by the combination of obovate leaves with obtuse apex, presence of (few) pitdomatia, and the spreading tepals that are densely pubescent on the inner surface. Most species in the O. minarum group have leaves with an acute apex; in Peru only *O. obovata* (Ruiz & Pavón) Mez is reported to have leaves with a rounded or obtuse

apex, but that species does not have domatia. *Ocotea tillettsiana* Allen is the species most similar to *O. lenitae*; it has leaves with a rounded apex, spreading tepals at anthesis, and pit-domatia; it differs in its sparser indument on twigs and flowers, in having shorter petioles (to 1 cm long), more domatia, and raised tertiary venation. *Ocotea tillettsiana* is an incompletely known species reported from Guyana and adjacent Venezuela.

The pit-domatia on the leaves of *Ocotea lenitae* are not numerous. Many leaves do not have these domatia and one has to search carefully for their presence. Several collections placed here in *O. lenitae* had been previously identified as *O. oblonga* (Meisner) Mez, and duplicates may have been distributed under that name.

It is a pleasure to dedicate this species to my wife, Lenita, in recognition of her interest in and steadfast support of my work.

Phenology. Flowering April–June; fruiting January.

Paratypes. PERU. Depto. **San Martín:** Rioja Prov., along road Rioja–Yorongos–La Florida (pistillate fl), *H. van der Werff, R. Vasquez, B. Gray & J. Campos 16510* (MO); along road Yorongos–La Florida (young fr), *H. van der Werff, R. Vasquez, B. Gray & J. Campos 16545* (MO). **Depto. Amazonas:** Quebrada Kayamas, Lugar Cenepa (herm. fls), *E Ancuash 170* (MO); Quebrada yutui entsa (herm. fls), *E. Ancuash 217* (MO). ECUADOR. **Pastaza Prov.:** Via Auca, 115 km S of Coca (fr), *F. Hurtado, W. Palacios & C. Iguago 1375* (MO); 35 km SE of Curaray (buds), *Espinoza 300* (MO, QCNE). **Napo Prov.:** Río Payamino (buds), *L. Holm-Nielsen & S. Jeppesen 801* (AAU, MO); Via Coca–Auca, km 17 (fr), *W. Palacios* 3514 (MO); PN Yasuni (fr), *A. Grijalva 763* (MO, QCNE), (st), *M. Aulestia & T. Ahue 2766* (MO, QCNE), (herm. fls), *M. Aulestia 2272* (MO, QCNE), (buds), *W. Palacios 2363* (MO, QCNE); Reserva Etnica Huaorani (herm. fls), *M. Aulestia 3642* (MO, QCNE), (buds), *M. Aulestia 3616* (MO, QCNE), (herm. fls), *M. Aulestia 3635* (MO, QCNE).

6. Ocotea leptophylla van der Werff, sp. nov. TYPE: Peru. Depto. Amazonas: Bagua Prov., Distr. Imaza, Comunidad Aguaruna de Wanas (km 92 Carretera Bagua–Imacita), Cerros Chinim, 700–800 m, 29 Aug. 1996 (male fl), *C. Diaz, A. Peña, L. Tsamajain & M. Roca 8076* (holotype, HUT; isotypes, HBG, K, MO, NY, US, USM). Figure 6.

A congeneris foliis subtus glaucis, inflorescentiis foliisque ad ramulos hornotinos limitatis distincta.

Trees, to 25 m; young twigs angular, densely brown tomentellous, the surface completely covered, older twigs glabrescent, dark, with scars from fallen leaves; terminal buds densely brown tomentellous. Leaves 4–11 × 2–5 cm, membranaceous to chartaceous, elliptic to obovate-elliptic, clustered on the recent flush, older twigs leafless; base obtuse to acute, the apex acute, the margin flat; upper surface glabrous, except for the pubescent midrib, lower surface glaucous, with scattered erect hairs or almost glabrous, the indument denser on the major veins; domatia lacking; midrib and lateral veins immersed, tertiary venation slightly raised on the upper surface, midrib raised, lateral veins weakly raised and tertiary venation immersed on lower surface; lateral veins 5 to 7 on each side; petioles 10–15 mm long, densely pubescent, flat above. Inflorescences to 7 cm long, in the axils of bracts, rarely in the axils of leaves, along the young twigs; densely tomentellous, the surface entirely or largely covered, paniculate-cymose. Staminate flowers green or cream-colored, 2.5–3 mm diam., tepals ca. 1 mm long, ovate, half-erect at anthesis, densely pubescent on the outer surface, sparsely pubescent on the inner surface, but more densely so at the base, stamens 9, all 4-celled, in 2 superposed pairs, outer 6 stamens 0.6 mm long, the cells opening introrse or the lower two lateral, the filament very short, 0.2 mm, pubescent; inner 3 stamens 0.8 mm long, the cells opening extrorse, glands present at the base of the short filaments, staminodia not seen, pistillode lacking or small, glabrous; receptacle shallow, pubescent inside; pistillate flowers, fruits, and cupules not known.

Ocotea leptophylla is easily recognized by its glaucous, thin leaves and its short, densely tomentellous inflorescences, both of which are confined to the recent growth. Rarely do a few older leaves persist, and those have a darker lower leaf surface. The indument on the lower leaf surface varies from sparse to almost lacking. The stamens have very short filaments; normally *Ocotea* stamens have distinct, narrow filaments, while the closely related genus *Rhodostemonodaphne* Rohwer & Kubitzki has sessile or almost sessile anthers. Most species of *Rhodostemonodaphne* have clearly larger flowers than those of *O. leptophylla*, but flowers of *R. parvifolia* Madriñan are almost as small as those of *O. leptophylla*. Still, anthers of *R. parvifolia* are sessile, while those of *O. leptophylla* have a distinct, short filament; this is the main reason to describe the new species in *Ocotea* rather than in *Rhodostemonodaphne*.

Phenology. Flowering August–September.

Paratype. PERU. **Depto. Amazonas:** Bagua Prov., Distr. Imaza, Comunidad de Kampaenza, *N. Jaramillo, R. Apanu & S. Katip 487* (HUT, MO).

Figure 7. *Ocotea vasquezii* van der Werff, the MO isotype, *Vasquez et al. 21739.*

7. Ocotea vasquezii van der Werff, sp. nov. TYPE: Peru. Depto. Amazonas: Prov. Bagua, Distr. Imaza, Yamayakat, 05°03′S, 78°20′W, 480 m, 9 Nov. 1996 (fl), *R. Vasquez, P. Stern, R. Rojas & R. Aguilar 21739* (holotype, HUT; isotypes, HBG, K, MO, NY, US). Figure 7.

Ocoteae atirrensi affinis, sed ramulis solidis, staminibus verticelli III subglabris vel glabris et cupulis parvis, planis recedit.

Treelets or small trees, to 10 m; twigs angular to terete, glabrous or with a few small, appressed hairs, solid, terminal buds rather densely appressed pubescent. Leaves 15–35 × 7.5–15 cm, elliptic to broadly elliptic, alternate, evenly distributed along the twigs, papyraceous, the base acute to obtuse, the margin flat, apex acute or acuminate, the acumen 1 cm long, glabrous on both surfaces, domatia absent, venation immersed on the upper surface, midrib prominently raised, lateral veins and tertiary venation raised on lower surface; lateral veins 7 to 10 pairs; petioles 10–16 mm long, glabrous, ridged above. Inflorescences 7–20 cm long, paniculate cymose, in the axils of leaves or cataphylls near the tips of the branches, moderately to sparsely puberulous. Flowers hermaphrodite, 2.5–3 mm diam., white or yellow, pedicels ca. 2 mm long; tepals erect or half-erect at anthesis, ca. 1.5 mm long, ovate, moderately to densely pubescent outside, when moderately pubescent, the inner tepals with a denser indument than the outer ones; stamens 9, all 4-celled, the cells in 2 superposed pairs, the outer stamens 6 with introrse cells, ca. 1.3 mm long, the filament as long as the anther, glabrous or with a few hairs along the filament, the inner 3 with extrorse cells, ca. 1 mm long, the anther slightly longer than the filament, glabrous or with a few hairs along the filament; globose glands present at

the base of the inner stamens; staminodia not seen; pistil glabrous, 1.5 mm long, the style a little longer than the ovary, stigma platelike; receptacle shallowly cup-shaped, glabrous inside. Fruits ellipsoid, 3.5 × 1.7 cm, cupule consisting of a small plate, 6 mm diam.; tepals deciduous in fruit.

Ocotea vasquezii is closely related to or belongs in the Ocotea insularis group. Its appearance is similar to *O. atirrensis* Mez & Donnell Smith from Central America; large, dark green drying, papyraceous leaves, copiously branched inflorescences, more or less erect tepals at anthesis, and the habit, a small tree. It differs from *O. atirrensis* in having solid stems, a small, platelike cupule (*O. atirrensis* has a small cup-shaped cupule) and in the absence of the tuft of hairs at the junction of filaments and anthers of the inner stamens. *Ocotea insularis* is less similar; it has domatia, decurrent leaf bases, firmer leaves drying a brighter green color in addition to having a cup-shaped cupule. *Ocotea atirrensis* is not known from South America, while *O. insularis* s.l. is not uncommon in Colombia, Ecuador, and to a lesser degree in Peru.

It is a pleasure to dedicate this species to Rodolfo Vasquez, the collector of the type, who through his publications and collections has greatly expanded our knowledge of the flora of Peru.

Phenology. Flowering October–November; fruiting June–August.

Paratypes. PERU. **Depto. Amazonas:** Prov. Bagua, Distr. Imaza, Tuyankuwas, comunidad de Yanat (fl), *E. Chavez 77* (MO); Distr. Imaza, Yamayakat (fr), *R. Vasquez, R. Ortiz-Gentry, N. Jaramillo & R. Apanu 18700* (MO), (buds), *R. Vasquez & N. Jaramillo 20264* (MO), (fl), *R. Vasquez, P. Stern, R. Rojas & R. Aguilar 21582* (MO), (fr), *R. Vasquez, A. Peña & E. Chaves 23945* (MO), (fl), *R. Vasquez, A. Peña & E. Chavez 24902* (MO); Distr. Imaza, Quebrada Kuzu (fr), *C. Diaz, S. Katip & A. Peña 6958* (MO); Distr. El Cenepa, Mamayaque (fr), *R. Vasquez, R. Rojas, A. Peña, E. Chavez & E. Quiaco 24569* (MO), (fr), *R. Rojas, A. Peña & E. Chavez 235* (MO).

Acknowledgments. Fieldwork in Peru was supported by the Taylor Fund for Ecological Research. Fred Keusenkothen made the scanned images. Last, and most importantly, I thank my colleagues in Peru for their excellent collections.

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New Combinations and Synonyms in Chinese *Pyrenaria* s.l. (Theaceae)

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ABSTRACT. Six new combinations in *Pyrenaria* (Theaceae) are made. These are: *Pyrenaria spectabilis* (Champion) C. Y. Wu & S. X. Yang, *P. spectabilis* var. *greeniae* (Chun) S. X. Yang, *P. maculatoclada* (Y. K. Li) S. X. Yang, *P. wuiana* (Hung T. Chang) S. X. Yang, *P. jongquieriana* Pierre ex Lanessan subsp. *multisepala* (Merrill & Chun) S. X. Yang, and *P. diospyricarpa* Kurz var. *camelliiflora* (Kurz) S. X. Yang. *Pyrenaria burmanica* T. K. Paul & Nayar newly synonymizes to *Pyrenaria diospyricarpa* var. *diospyricarpa*. *Pyrenaria tibetana* Hung T. Chang newly synonymizes to *Pyrenaria khasiana* R. N. Paul. *Thea shinkoensis* Hayata and *Tutcheria tenuifolia* Hung T. Chang newly synonymize to *Pyrenaria microcarpa* (Dunn) H. Keng var. *microcarpa*. *Camellia buisanensis* Sasaki, *Tutcheria symplocifolia* Merrill & F. P. Metcalf, and *Tutcheria taiwanica* Hung T. Chang & S. X. Ren newly synonymize to *Pyrenaria microcarpa* (Dunn) H. Keng var. *ovalifolia* (H. L. Li) T. L. Ming & S. X. Yang. *Tutcheria brachycarpa* Hung T. Chang newly synonymizes to *Pyrenaria spectabilis* (Champion) C. Y. Wu & S. X. Yang var. *spectabilis*. *Tutcheria austrosinica* Hung T. Chang, *Tutcheria rostrata* Hung T. Chang, and *Pyrenaria turbinata* S. X. Yang newly synonymize to *Pyrenaria spectabilis* (Champion) C. Y. Wu & S. X. Yang var. *greeniae* (Chun) S. X. Yang. In addition, *Pyrenaria microcarpa* (Dunn) H. Keng is lectotypified.

Key words: China, *Pyrenaria*, Theaceae.

Keng (1980), Yang (1997), and Chang (1998) have published regional taxonomic revisions of the Malesian and Chinese *Pyrenaria* Blume and *Tutcheria* Dunn (Theaceae). Keng (1972) first reduced *Tutcheria* into *Pyrenaria*. Yang and Ming (1995a, 1995b) and Yang (1997) supported Keng's (1972) opinion and further reduced *Parapyrenaria* Hung T. Chang into *Pyrenaria*. A worldwide taxonomic revision of *Pyrenaria* s.l. has been carried out as a Ph.D. dissertation by the author (Yang, 2000) in which the more than 90 specific and infraspecific epithets are reduced to 25 species, including two subspecies and ten varieties. A detailed monographic account of this genus will be forthcoming. Seven of the 13 *Pyrenaria* species that occur in China require one or more new combinations or other taxonomic treatment and are here published in order to make the names to available for the *Flora of China* Theaceae treatment.

1. Pyrenaria diospyricarpa Kurz, J. Asiat. Soc. Bengal. 42(2): 60. 1873. TYPE: Myanmar. Martaban, 15 Aug. 1872, *S. Kurz 1023* (holotype, K).

Pyrenaria burmanica T. K. Paul & Nayar, J. Jap. Bot. 64(1): 8. 1989. Syn. nov. TYPE: Myanmar. Tenasseriu, Humatee, 5000 ft., 10 Apr. 1877, *Geo Gallatly 695* (holotype, CAL not seen; isotype, CAL).

Except for the non-foliaceous bractlets and sepals, *Pyrenaria burmanica* is morphologically indistinguishable from *P. diospyricarpa* var. *diospyricarpa*. With the observation of gradual transitions from non-foliaceous bractlets and sepals to foliaceous ones in my field investigations, the gap between both taxa is bridged.

1a. Pyrenaria diospyricarpa Kurz var. **diospyricarpa**

Distribution and habitat. Southern Yunnan, China; Myanmar; Thailand; Vietnam. Forests on hills, slopes, or valleys between 1000 and 2000 m (Yang, 1997).

1b. Pyrenaria diospyricarpa Kurz var. **camelliiflora** (Kurz) S. X. Yang, comb. et stat. nov. Basionym: *Pyrenaria camelliiflora* Kurz, J. Asiat. Soc. Bengal. 40(2): 46. 1871. TYPE: Myanmar. Martaban, Doyokee pass, 4000 ft., *D. Brandis s.n.* (holotype, CAL not seen).

This taxon is different from *P. diospyricarpa* only by its branchlets and leaves with less pubescence. It is more acceptable to treat it as a variety.

Distribution and habitat. Myanmar; Thailand; Vietnam. Forests between 900 and 1500 m (Yang, 1997).

2. Pyrenaria jonquieriana Pierre ex Lanessan, Pl. Util. Colon. Franc., 295. 1886. TYPE: Laos. Attapeu Basin, western bank of Mekong, *Harmand 4005* (holotype, P).

2a. Pyrenaria jonquieriana Pierre ex Lanessan subsp. **jonquieriana**

Distribution and habitat. Laos. Forests between 400 and 1700 m.

2b. Pyrenaria jonquieriana Pierre ex Lanessan subsp. **multisepala** (Merrill & Chun) S. X. Yang, comb. et stat. nov. Basionym: *Tutcheria multisepala* Merrill & Chun, Sunyatsenia 2(1): 41. 1934. *Parapyrenaria multisepala* (Merrill & Chun) Hung T. Chang, Acta Sci. Nat. Univ. Sunyatseni 18(3): 74. 1979. *Pyrenaria multisepala* (Merrill & Chun) H. Keng, Gard. Bull. Singapore 26(1): 134. 1972. TYPE: China. Hainan: Wanning (Manyun), Tungshanling, 5 Apr. 1932, *H. Y. Liang 61513* (holotype, IBSC; isotype, PE).

Except that it has more sepals (more than 20), *Tutcheria multisepala* is almost the same as *Pyrenaria jonquieriana*. Considering their disjunct distribution, it is suitable for us to treat them as different subspecies.

Distribution and habitat. Hainan, China. Forests between 800 and 1000 m.

3. Pyrenaria khasiana R. N. Paul, Bull. Bot. Soc. Bengal. 33: 115. 1979. TYPE: India. Meghalaya, Khasi hills, 675–1000 m, *S. Kurz 161* (holotype, CAL not seen; isotype, CAL).

Pyrenaria tibetana Hung T. Chang, Acta Sci. Nat. Univ. Sunyatseni 22(3): 64. 1983. Syn. nov. TYPE: China. SE Tibet, Medog, NW of Didongzhan, in evergreen forest, 3 Aug. 1974, *Qinghai-Xizang (Tibet) Exped. Acad. Sin. 74-1848* (holotype, PE; isotype, KUN).

No natural differences can be found between the type specimens of *Pyrenaria khasiana* and *P. tibetana*. It is thus inappropriate to treat them as different species.

Distribution and habitat. Southeastern Xizang (Tibet), China; northeastern India. Evergreen forest between 675 and 2100 m.

4. Pyrenaria maculatoclada (Y. K. Li) S. X. Yang, comb. nov. Basionym: *Tutcheria maculatoclada* Y. K. Li, Guihaia 4(1): 35. 1984. TYPE: China. Guizhou: Sandu, Yaorenshan, alt. 910 m, 8 Sep. 1982, *C. Z. Dang 2198* (holotype, HGAS).

Tutcheria maculatoclada has been reduced into *Pyrenaria greeniae* (Chun) Keng (Yang, 1997) or *Tutcheria greeniae* Chun (Chang, 1998). Its recognition as an independent species in *Pyrenaria* is based on its succulent pericarp.

Distribution and habitat. Northern Guangxi and southern Guizhou, China. Forests between 700 and 1000 m (Yang, 1997).

5. Pyrenaria microcarpa (Dunn) H. Keng, Gard. Bull. Singapore 26(1): 134. 1972. Basionym: *Tutcheria microcarpa* Dunn, J. Bot. 47: 197. 1909. TYPE: China. Guangdong: Boluo, Lo Fou Mountains, *Ford 610* (lectotype, designated here, IBSC).

Thea shinkoensis Hayata, J. Coll. Sci. Imp. Univ. Tokyo 30(1): 45. 1911. Syn. nov. *Tutcheria shinkoensis* (Hayata) Nakai, J. Jap. Bot. 16(12): 708. 1940. TYPE: China. Taiwan: Taipeh, Shinko, Remogansha, 8 June 1906. *T. Kawakami & U. Mori 1324* (holotype, TI).

Tutcheria tenuifolia Hung T. Chang, Acta Sci. Nat. Univ. Sunyatseni 22(2): 108. 1983. Syn. nov. TYPE: China. Guangxi: Longzhou, Daqing Mt., near Nadian Village, 27 June 1957, *S. H. Chun 12833* (holotype, IBSC; isotype, KUN).

Dunn (1909) listed two specimens under *Tutcheria microcarpa* Dunn: *Ford 610* and *Hongkong Herb. 2058*. I checked them in IBSC. Both of them correspond to the protologue, but the first collection is in better condition, so it is selected as the lectotype here.

Thea shinkoensis was treated as a variety of *Pyrenaria microcarpa* based only on its description (Yang, 1997). I studied the type specimen of *T. shinkoensis* at TI and found that it shares almost all features with *P. microcarpa* except that a few leaves of *T. shinkoensis* are subacuminate.

Tutcheria tenuifolia is different from *P. microcarpa* in its obvious pedicel (7–8 mm long). In fact, the pedicel of *P. microcarpa* is variable, from 1 to 10 mm in length.

5a. Pyrenaria microcarpa (Dunn) H. Keng var. **microcarpa**

Distribution and habitat. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hainan, Jiangxi, Taiwan, and Zhejiang, China; Ryukyu Islands, Japan; Vietnam. Forests in mountain valleys or along streams between 300 and 1000 m (Yang, 1997).

5b. Pyrenaria microcarpa (Dunn) H. Keng var. **ovalifolia** (H. L. Li) T. L. Ming & S. X. Yang, Chin. J. Appl. Environm. Biol. 3(3): 287. 1997. Basionym: *Tutcheria ovalifolia* H. L. Li,

J. Arnold Arbor. 25(2): 209. 1944. TYPE: China. Hainan: Baoting, in forest, 16 Nov. 1936, *S. K. Lau 28218* (holotype, A; isotype, IBSC).

Pyrenaria buisanensis (Sasaki) C. F. Hsieh, S. Z. Yang & M. H. Su, Taiwania 49(3): 202. 2004. Syn. nov. Basionym: *Camellia buisanensis* Sasaki, Trans. Nat. Hist. Soc. Form. 21: 222. 1931. *Camelliastrum buisanensis* (Sasaki) Nakai, J. Jap. Bot. 16(12): 700. 1940. TYPE: China. Taiwan: Pingtung [Pingdong] Co., Mt. Jenlishan, 30 May 2004, *K. T. Lee & Y. K. Wu s.n.* (neotype designated by Su et al. (2004: 202), TAI).

Tutcheria symplocifolia Merrill & F. P. Metcalf, Lingnan Sci. J. 16(2): 172. 1937. Syn. nov. TYPE: China. Guangdong: Ta-pu, Tai Mo Shan, 16 July 1932, *W. T. Tsang 21196* (holotype, IBSC; isotype, PE).

Tutcheria taiwanica Hung T. Chang & S. X. Ren, Acta Sci. Nat. Univ. Sunyatseni 30(1): 71. 1991. Syn. nov. TYPE: China. Taiwan: Pingtung [Pingdong] Co., Bankinsing, tree 20 ft., 25 Feb. 1893–1894, *A. Henry 123* (holotype, US).

Through a wide range of herbarium and field investigations, two variable foliar trends in *Pyrenaria microcarpa* have been determined: from oblong to obovate in shape and from acuminate to acute to obtuse to blunt at the apex, which resulted in the establishment of a few ambiguous species, including *Tutcheria ovalifolia*, *T. symplocifolia*, *T. taiwanica*, and *C. buisanensis*. Hereby, those species with leaves obovate in shape and obtuse to blunt at the apex are treated as the variety *ovalifolia*.

Distribution and habitat. Fujian, Guangdong, Hainan, and northern Taiwan, China. Forests below 100 to 1000 m (Yang, 1997).

6. Pyrenaria spectabilis (Champion) C. Y. Wu & S. X. Yang, comb. nov. Basionym: *Camellia spectabilis* Champion, Hooker's J. Bot. Kew Gard. Misc. 3: 310. 1851. *Thea spectabilis* (Champion) Kochs, Bot. Jahrb. Syst. 27: 595. 1900. *Tutcheria spectabilis* (Champion) Dunn, J. Bot. 46: 324. 1908. TYPE: China. Hong Kong: Hong Kong Island, 1847, *Champion s.n.* (holotype, K).

Tutcheria brachycarpa Hung T. Chang, Acta Sci. Nat. Univ. Sunyatseni 22(2): 109. 1983. Syn. nov. TYPE: China. Guangxi: Jinxiu (Yaoshan), *S. S. Sin 328* (holotype, IBSC).

The type specimen of *Tutcheria brachycarpa* shows no essential difference from *P. spectabilis*. It is unreasonable to retain it as a species.

6a. Pyrenaria spectabilis (Champion) C. Y. Wu & S. X. Yang var. **spectabilis**

Distribution and habitat. Fujian, Guangdong, Guangxi, and Hong Kong, China; northern Vietnam. Broadleaf evergreen forests between 300 and 1500 m (Yang, 1997).

6b. Pyrenaria spectabilis (Champion) C. Y. Wu & S. X. Yang var. **greeniae** (Chun) S. X. Yang, comb. et stat. nov. Basionym: *Tutcheria greeniae* Chun, J. Arnold Arbor 9(2–3): 129. 1928. TYPE: China. Guangdong: North River region, Pan lin tsze, in open woods, 25 Dec. 1927, *W. Y. Chun 5937* (holotype, IBSC; isotypes, A, PE).

Tutcheria austrosinica Hung T. Chang [as "*austro-sinica*"], Acta Sci. Nat. Univ. Sunyatseni 22(2): 107. 1983. Syn. nov. TYPE: China. Guangdong: Yangchun, Heweishan, Meizi Region, 7 June 1957, *Lab. Geobot. Inst. Bot. Austro-Sin. 4258* (holotype, IBSC).

Tutcheria rostrata Hung T. Chang, Acta Sci. Nat. Univ. Sunyatseni 22(2): 106. 1983. Syn. nov. TYPE: China. Guangdong: Yangchun, Heweishan to Sanchahe, 19 Oct. 1957, *W. T. Lin 30962* (holotype, CANT).

Pyrenaria turbinata S. X. Yang, Chin. J. Appl. Environm. Biol. 3(3): 281. 1997. Syn. nov. TYPE: China. Guangxi: Nanning, cultivated in Guangxi Forest Institute (introduced from Hexian), 24 Oct. 1991, *S. X. Yang & W. J. Zhang 91041* (holotype, KUN).

The fruit of this taxon is quite variable in pericarp thickness (from 1 to 2, even to 4 mm), locule numbers (ranging from 3, 4, to 5), apex shape (from acute to obtuse to blunt), which bridge these morphological gaps between *Tutcheria austrosinica*, *T. rostrata*, *Pyrenaria turbinata*, and *T. greeniae*.

Distribution and habitat. Southern Fujian, Guangdong, Guangxi, southern Hunan, and southern Jiangxi, China. Broadleaf evergreen forests between 300 and 1200 m (Yang, 1997).

7. Pyrenaria wuiana (Hung T. Chang) S. X. Yang, comb. nov. Basionym: *Tutcheria wuiana* Hung T. Chang, Acta Sci. Nat. Univ. Sunyatseni 6(1): 29. 1961. TYPE: China. Guangdong: Luoding, Jiayi, Yadaodashan Hill, 6 Sep. 1959, *B. S. Wang & L. C. Xu 0014* (holotype, SYS).

Based on the leaf-like bractlets, large and oblong sepals, and acuminate fruit, the previous taxonomic treatment reducing this species into *Pyrenaria grandiflora* (Wu) Ming & S. X. Yang (Yang, 1997) should be corrected.

Distribution and habitat. Western Guangdong and eastern Guangxi, China. Forests between 800 and 900 m (Yang, 1997).

Acknowledgments. The study was partially supported by funds from the National Natural Sciences Foundation of China (Grant no. 30470136), a project of the Provincial Natural Sciences Foundation

Committee of Yunnan, P. R. China (97C039Q), and the special support grants from The Chinese Academy of Sciences for biotaxonomy and floristics. I am most grateful to A, CAL, CANT, HGAS, IBSC, K, P, PE, SYS, TI, and US for kindly providing specimens. I also express my deep gratitude to V. C. Hollowell (MO), N. Turland (MO), and B. Bartholomew (CAS) for critical reviews of the manuscript.

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Lectotypification of *Machilus platycarpa* and *Machilus gracillima* (Lauraceae)

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ABSTRACT. In the description of two species of *Machilus*, Chun cited two type collections. In each case, one of the type collections does not belong in the Lauraceae. Lectotypification of these two names is proposed.

Key words: China, Lauraceae, lectotypification, *Machilus*.

During a project aimed at cataloging names and types of Chinese Lauraceae, problems were encountered with the types of two species of the genus *Machilus* Nees described by Chun (1953). In Chun's article, species were first described in Chinese, including citation of a type and paratypes when available, followed by a translation in Latin, again with citation of a type and paratypes. In two cases the type collection cited in the Chinese description was different from the type collection cited in the Latin description. Both names have been used in subsequent publications (Lee, 1982; Wei et al., 1991). In order to avoid confusion about the correct type specimen for these two names in *Machilus*, we lectotypify both names and explain the reasons for our lectotypification in this note.

1. LECTOTYPIFICATION OF *MACHILUS PLATYCARPA* CHUN

Machilus platycarpa was published in Chun (1953), with the Chinese description on page 163 and the Latin description on page 164. Chun designated *S. P. Ko 51351* as the type collection in the Chinese description and *C. Wang 38722* in the Latin description. Chun worked at IBSC. His original material should be expected in IBSC, and indeed both collections are present in that institution. The first author had the opportunity to study both collections and found that *C. Wang 38722* belongs to the Lauraceae and fits the description of *Machilus platycarpa* Chun. Further, the collection *S. P. Ko 51351* does not belong to the Lauraceae, but represents *Oreocnide frutescens* (Thunberg) Miquel (Urticaceae). Clearly, a lectotype is needed in this situation, which we designate below.

Machilus platycarpa Chun, Acta Phytotax. Sin. 2: 163, pl. 29. 1953. TYPE: China. Guangdong: Yangchun County, Mount Liping, 13 Nov. 1935, *C. Wang 38722* (lectotype, designated here, IBSC; isotypes, IBK, MO).

2. LECTOTYPIFICATION OF *MACHILUS GRACILLIMA* CHUN

The case of *Machilus gracillima* is similar to the preceding one. Chun designated *C. Wang 41072* as the type in the Chinese description and *C. Wang 41022* as the type in the Latin description. A search in IBSC yielded the collection *C. Wang 41072*, which indeed belongs to the Lauraceae and fits the description of *M. gracillima*. However, the collection *C. Wang 41022* could not be located in IBSC; records kept at IBSC indicated that *C. Wang 41022* belonged to *Stachyurus chinensis* Franchet (Stachyuraceae). Subsequently, the first author found a duplicate of *C. Wang 41022* in PE. This specimen represented *Stachyurus chinensis*, as indicated by the records at IBSC. Again, lectotypification is required to resolve this taxonomic/nomenclatural confusion.

Machilus gracillima Chun, Acta Phytotax. Sin. 2: 170, pl. 35. 1953. TYPE: China. Guangxi: Nandan County, Mangchang, Mengguo, 10 July 1937, *C. Wang 41072* (lectotype, designated here, IBSC).

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Volume 15, Number 2, pp. 253–384 of NOVON was published on 13 July 2005.

Volume 15
Number 3
2005

NOVON

Transfer of the South African Genera *Brachycarpaea*, *Cycloptychis*, *Schlechteria*, *Silicularia*, and *Thlaspeocarpa* to *Heliophila* (Brassicaceae)

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Abstract. The genera *Brachycarpaea*, *Cycloptychis*, *Schlechteria*, *Silicularia*, and *Thlaspeocarpa* are united with *Heliophila* (Brassicaceae). Except for *Brachycarpaea*, the genera are treated as new synonyms of *Heliophila*. The characters previously used to distinguish these genera are critically evaluated. The retention of *Brachycarpaea* and *Silicularia* in *Heliophila* would not necessitate any nomenclatural novelties, but the transfer of species of the remaining three genera to *Heliophila* requires a new combination and four new names. The new combination *H. namaquensis* and the new names *H. monosperma*, *H. maraisiana*, *H. hurkana*, and *H. suborbicularis* are proposed.

Key words: *Brachycarpaea*, Brassicaceae, *Cycloptychis*, *Heliophila*, Namibia, *Schlechteria*, *Silicularia*, South Africa, *Thlaspeocarpa*.

As delimited by Appel and Al-Shehbaz (1997), the southern African tribe Heliophileae (Brassicaceae) consists of 80 species in the genera *Heliophila* L. (73 spp.), *Brachycarpaea* DC. (1 sp.), *Cycloptychis* E. Meyer ex Sonder (2 spp.), *Schlechteria* Bolus (1 sp.), *Silicularia* Compton (1 sp.), and *Thlaspeocarpa* C. A. Smith (2 spp.). Of these, 78 species, including those of the 5 smaller genera above, are distributed in the Cape provinces of South Africa and 8 grow in Namibia, 3 in Lesotho, and 1 in Swaziland (Marais, 1970; Pienaar & Nicholas, 1988; Bean, 1990). With the exception of *Brachycarpaea*, which has spirally coiled cotyledons, the taxa of the tribe have diplecolobal cotyledons (twice transversely folded). The latter type of cotyledons also occurs in 3 species of *Lepidium* L. subsect. *Diploploca* Hewson (Hewson, 1982), but molecular studies (Mummenhoff, unpublished) clearly show this feature evolved independently in *Lepidium* and the Heliophileae.

Molecular studies by Mühlhausen (2002) and Mummenhoff et al. (2005), using internal transcribed spacers of nuclear ribosomal DNA (ITS) and the *trn*L intron of cpDNA, reveal that all six genera of the Heliophileae form a monophyletic clade, with *Brachycarpaea*, *Cycloptychis*, *Schlechteria*, *Silicularia*, and *Thlaspeocarpa* nested within the morphologically far more diversified *Heliophila*. It is concluded that the Heliophileae should consist of one inclusive *Heliophila*, and the nomenclatural changes needed to unite the smaller genera with *Heliophila* are proposed below. In our opinion, these smaller genera are based on one-character fruit differences and, in the absence of fruits, their species cannot be distinguished from those of *Heliophila*. For a detailed comparison of all six "genera," see Table 2 in Appel and Al-Shehbaz (1997). Koch et al. (2003) summarized many similar mo-

lecular studies in the Brassicaceae that led to the union of monotypic or oligotypic genera with their larger, paraphyletic, more inclusive relatives.

Brachycarpaea

Hayek (1911) placed *Brachycarpaea* in the tribe Heliophileae, and Schulz (1936) assigned it to the Lepidieae. In their tribal assignment of this genus, Schulz emphasized the presence of angustiseptate fruits (flattened at a right angle to the septum), whereas Hayek relied on the overall similarities in habit, flowers, distribution, and the presence of linear cotyledons. Except for fruit compression and cotyledonary coiling, *B. juncea* (P. J. Bergius) Marais is indistinguishable morphologically from species of *Cycloptychis* and many *Heliophila*. The presence of angustiseptate fruits in *Brachycarpaea* is unique in the Heliophileae, but as shown by Appel and Al-Shehbaz (2003), this and other types of fruit compression occur within several individual genera of the Brassicaceae (e.g., *Graellsia* Boissier, *Lesquerella* S. Watson (now *Physaria* (Nuttall) A. Gray), *Smelowskia* C. A. Meyer).

Indeed, the fruits of *B. juncea* are only slightly angustiseptate, but they have woody, one-seeded, indehiscent valves borne on a tiny carpophore and, therefore, they are schizocarpic much like those of *Cycloptychis*. The latter genus is easily distinguished from *Brachycarpaea* by having a longer carpophore and woody, rugose (vs. smooth) latiseptate (flattened parallel to the septum) instead of angustiseptate fruits. In the molecular study (Mummenhoff et al., 2005), the two genera form a well-supported clade nested within *Heliophila*.

The single species of *Brachycarpaea* was originally described by Bergius (1767) as *Cleome juncea* P. J. Bergius. Druce (1917) transferred it to *Heliophila* and Marais (1966) to *Brachycarpaea*, but Marais (1966, 1970) overlooked Druce's transfer. Therefore, the species should be known in *Heliophila* as *H. juncea* (P. J. Bergius) Druce, and no nomenclatural changes are needed from the union of *Brachycarpaea* and *Heliophila*.

Cycloptychis

In the absence of fruits, both species of *Cycloptychis* are morphologically indistinguishable from *Brachycarpaea juncea* and several species of *Heliophila*. The genus is based solely on having schizocarpic, latiseptate fruits with a distinct carpophore and rugose, woody valves. All species of *Heliophila* have dehiscent, smooth, non-woody fruits without a carpophore. As indicated above, molecular data (Mummenhoff et al., 2005) reveal that *Cycloptychis* forms with *Brachycarpaea* a monophyletic subclade deeply nested within *Heliophila*. Although the presence of typically schizocarpic fruits with a distinct carpophore in *Cycloptychis* is unique among all of the Old World genera of Brassicaceae, the feature evolved independently in the South American *Menonvillea* DC. (Rollins, 1955; Appel & Al-Shehbaz, 2003). As shown below, the transfer to *Heliophila* of the basionyms of *C. virgata* (Thunberg) E. Meyer ex Sonder and *C. marlothii* O. E. Schulz would create two later homonyms, and the new names *H. maraisiana* and *H. hurkana*, respectively, are proposed to facilitate those transfers and the union of *Cycloptychis* with *Heliophila*.

Schlechteria and *Thlaspeocarpa*

Hayek (1911) assigned *Schlechteria* to the tribe Alysseae and Schulz (1936) placed it in the Lunarieae, but both authors overlooked the diplecolobal cotyledons in *S. capensis* Bolus. However, Compton (1953) was the first to consider the genus to be closely related to *Heliophila*, a position accepted by subsequent authors (e.g., Marais, 1970; Appel & Al-Shehbaz, 1997).

Thlaspeocarpa was proposed by Smith (1931) as a new name replacing the later homonym *Palmstruckia* Sonder. The genus remained monotypic for nearly 100 years, and Marais (1966) added a second species to the one first discovered by Sonder (1860). *Thlaspeocarpa* has long been considered to be closely related to *Heliophila*, and their placement in the same tribe was not questioned.

Both *Schlechteria* and *Thlaspeocarpa* differ from *Heliophila* primarily by having indehiscent, eseptate fruits. These differences in fruit characters are minor, and one finds similar or more extreme situations within several genera of Brassicaceae. For example, *Lepidium* (including *Cardaria* Desvaux, *Coronopus* Zinn, and *Stroganowia* Karelin & Kirilov), *Physaria* (including *Lesquerella*), *Tropidocarpum* Hooker (including *Twisselmannia* Al-Shehbaz), and *Vella* L. (including *Boleum* Desvaux and *Euzomodendron* Cosson) have species with dehiscent or indehiscent and septate or eseptate fruits.

Appel and Al-Shehbaz (1997) separated *Thlaspeocarpa* from *Schlechteria* primarily by their being annual herbs instead of shrubs with appendaged versus unappendaged filaments and winged versus wingless seeds. However, all of these characters occur in a mosaic pattern within *Heliophila*. Based on our examination of all 73 species of *Heliophila*, 44 species are annuals, 7 are perennial herbs, and 22 are shrubs or subshrubs. Of the annuals, 9 have staminal appendages and seed wings, 6 have nei-

ther, 5 have seed wings but not appendages, and 19 have staminal appendages but not seed wings. Seed or filament information is not recorded for 5 species. Of the 22 shrubs and subshrubs, 2 have the seed wing and filament appendage, 14 have neither, 1 has only the appendage, and 3 have only the seed wing. Therefore, the differences between *Schlechteria* and *Thlaspeocarpa* are not supported, and the union of these genera with *Heliophila* is justified on morphological and molecular grounds.

The transfer of *Schlechteria capensis* Bolus and the basionym of *Thlaspeocarpa capensis* (Sonder) C. A. Smith to *Heliophila* would create later homonyms, and new names are proposed below to accommodate such transfers.

SILICULARIA

Silicularia basically mirrors the morphological situation of *Schlechteria* and *Thlaspeocarpa* in relation to *Heliophila*. It, too, has indehiscent fruits without a septum (sensu Appel & Al-Shehbaz, 1997) or with a fenestrated septum (Compton, 1953), but *Silicularia* differs from these three genera by having woody, rugose fruits. In all other aspects of the plant, *Silicularia polygaloides* (Schlechter) Compton, which is a shrub with unappendaged filaments and wingless seeds, is remarkably similar to numerous species of *Heliophila* and to *Schlechteria capensis*. In the absence of fruits, Compton (1953) indicated that the species (as *Silicularia sigillata* Compton) is indistinguishable from those of *Brachycarpaea* and *Schlechteria*. In fact, the species was originally described by Schlechter (1899) as *H. polygaloides* Schlechter and, therefore, its retention in *Heliophila* would not necessitate any nomenclatural changes, though Compton (1953), see below, mishandled the nomenclature of this and other closely related species of *Heliophila*.

Heliophila L., Sp. Pl., ed. 2, 2: 926. 1763. TYPE: *Heliophila integrifolia* L., Sp. Pl., ed. 2, 2: 926. 1763, nom. illeg. [Art. 52.1] = *Heliophila africana* (L.) Marais, in L. E. Codd et al., Fl. S. Africa 13: 55. 1970; based on *Cheiranthus africanus* L., Pl. Rar. Afr. 13. 1760.

Brachycarpaea DC., Mém. Mus. Hist. Nat. 7: 247. 1821. TYPE: *Brachycarpaea varians* DC., Syst. Nat. 2: 699. 1821. = *Brachycarpaea juncea* (P. J. Bergius) Marais, Bothalia 9: 112. 1966. *Heliophila juncea* (P. J. Bergius) Druce, Bot. Exch. Club Soc. Brit. Isles 1916: 627. 1917; based on *Cleome juncea* P. J. Bergius, Descr. Pl. Cap. 164. 1767.

Cycloptychis E. Meyer ex Sonder, in Harvey & Sonder, Fl. Cap. 1: 34. 1860. Syn. nov. TYPE: *Cycloptychis virgata* (Thunberg) E. Meyer ex Sonder, in Harvey & Sonder, Fl. Cap. 1: 34. 1860 (lectotype, designated by Marais, 1970: 80); based on *Cleome virgata* Thunberg, Prodr. 109. 1800.

Schlechteria Bolus, Bot. Jahrb. Syst. 24: 455. 1987. Syn. nov. TYPE: *Schlechteria capensis* Bolus, Bot. Jahrb. Syst. 24: 455. 1897.

Silicularia Compton, S. African J. Bot. 19: 147. 1953. Syn. nov. TYPE: *Silicularia sigillata* Compton, S. African J. Bot. 19: 147. 1953. = *Heliophila polygaloides* Schlechter, Bot. Jahrb. Syst. 27: 137. 1899, non *Heliophila polygaloides* (Sonder) Compton, S. African J. Bot. 19: 152. 1953.

Thlaspeocarpa C. A. Smith, Bull. Misc. Inform. Kew 1931: 155. 1931. Syn. nov. TYPE: *Thlaspeocarpa capensis* (Sonder) C. A. Smith, Bull. Misc. Inform. Kew 1931: 156. 1931; based on *Palmstruckia capensis* Sonder, in Harvey & Sonder, Fl. Cap. 1: 35. 1860, based on *Peltaria capensis* Thunberg, Prodr. 107. 1800, non L. f., Suppl. Pl. 296. 1782.

Heliophila monosperma Al-Shehbaz & Mummenhoff, nom. nov. Replaced name: *Schlechteria capensis* Bolus, Bot. Jahrb. Syst. 24: 455. 1897, non *Heliophila capensis* Kuntze, Revis. Gen. Pl. 3(2): 5. 1893, nec *Heliophila capensis* (L. f.) C. A. Smith, Bull. Misc. Inform. Kew 1931: 155. 1931. TYPE: South Africa. Cape: Clanwilliam, Koudeberg, 1300 m, 30 Aug. 1896, *R. Schlechter 8765* (holotype, not seen; isotypes, BM, K, MO).

This new name should be used when *Schlechteria* is united with *Heliophila*.

Heliophila juncea (P. J. Bergius) Druce, Bot. Exch. Club Soc. Brit. Isles 1916: 627. 1917. Basionym: *Cleome juncea* P. J. Bergius, Descr. Pl. Cap. 164. 1767. TYPE: South Africa. *Grubb s.n.* (holotype, SBT not seen).

This species name should be used for the transfer of *Brachycarpaea* to *Heliophila*. The name was not listed in Marais (1970). De Candolle (1821) listed the nomen nudum *H. juncea* Vahl in the synonymy of *H. suavissima* Burch ex DC., but that name has no relevance to the species recognized herein.

Heliophila maraisiana Al-Shehbaz & Mummenhoff, nom. nov. Replaced name: *Cleome virgata* Thunberg, Prodr. 109. 1800, non *Cleome virgata* Steven, in Candolle, Prodr. 1: 240. 1824, nec *Heliophila virgata* Burch ex DC., Syst. Nat. 2: 693. 1821. *Cycloptychis virgata* (Thunberg) E. Meyer ex Sonder, in Harvey & Sonder, Fl. Cap. 1: 34. 1860. TYPE: South Africa. *C. P. Thunberg s.n.* (holotype, UPS not seen).

Heliophila maraisiana is named in honor of Wessel Marais, whose accounts of the South African Brassicaceae (Marais, 1966, 1970) remain classic.

The species is most closely related to *H. hurkana*; both species were previously placed in the genus *Cycloptychis*. The characters distinguishing these species are discussed under *H. hurkana* below.

Heliophila namaquensis (Marais) Al-Shehbaz & Mummenhoff, comb. nov. Basionym: *Thlaspeocarpa namaquensis* Marais, Bothalia 9: 110. 1966. TYPE: South Africa. Cape: Namaqualand, Steinkopf, *J. H. P. Acocks 19536* (holotype, PRE).

This specific epithet should not be confused with *Heliophila namaquana* Bolus, an entirely different species with linear, dehiscent siliques 1.5–3.7 cm × 1–1.5 mm, instead of suborbicular, indehiscent silicles 1–1.3 × 0.8–1 cm.

Heliophila hurkana Al-Shehbaz & Mummenhoff, nom. nov. Replaced name: *Cycloptychis marlothii* O. E. Schulz, Bot. Jahrb. Syst. 66: 97. 1933, non *Heliophila marlothii* O. E. Schulz, Bot. Archiv. 31: 533. 1931. TYPE: South Africa. Cape: Ceres, [Swartruggens], 1000 m, Oct. 1903, *R. Marloth 3362* (holotype, PRE).

The species is named after Herbert Hurka (University of Osnabrück) for his life-long research on the Brassicaceae and on the occasion of his 65th birthday. From the other species of *Heliophila*, *H. hurkana* is easily distinguished by being a shrub with schizocarpic silicles, thick-walled valves, and a slender carpophore. From the closely related *H. maraisiana*, it easily distinguished by having fruits 8.5–12 mm long (excluding the style), styles 1.5–2 mm long, and leathery, finely reticulate-ridged fruit valves with an obscure midvein. By contrast, *H. maraisiana* has fruits 5–6 mm long (excluding the style), styles 4–6 mm long, and woody valves with a prominent midvein and four ridges on each side.

Heliophila polygaloides Schlechter, Bot. Jahrb. Syst. 27: 137. 1899. TYPE: South Africa. Cape: Koude Bokkeveld, 5000 ft., 8 Sep. 1896, *R. Schlechter 8900* (holotype, B).

As indicated above, this species was transferred by Compton (1953) to the monotypic *Silicularia*. However, Compton mishandled the nomenclature or taxonomy of this species in two ways. First, he transferred *Cycloptychis polygaloides* Sonder (Sonder, 1860) to *Heliophila* and made a later homonym, *H. polygaloides* (Sonder) Compton. Second, he failed to retain the name *H. polygaloides* Schlechter in *Heliophila* and replaced it with the superfluous and therefore illegitimate *H. nubigenoides* Compton. Taxonomically, he described the new genus and species *Silicularia sigillata* without realizing it is conspecific with Schlechter's *H. polygaloides*. Therefore, the sole species of *Silicularia* should be known in *Heliophila* as *H. polygaloides* Schlechter.

Heliophila suborbicularis Al-Shehbaz & Mummenhoff, nom. nov. Replaced name: *Peltaria capensis* Thunberg, Prodr. 107. 1800, non *Peltaria capensis* L. f., Suppl. Pl. 296. 1782, nec *Heliophila capensis* Kuntze, Revis. Gen. Pl. 3(2): 5. 1893, nec *Heliophila capensis* (L. f.) C. A. Smith, Bull. Misc. Inform. Kew 1931: 155. 1931. *Palmstruckia capensis* Sonder, in Harvey & Sonder, Fl. Cap. 1: 35. 1860. *Thlaspeocarpa capensis* (Sonder) C. A. Smith, Bull. Misc. Inform. Kew 1931: 155. 1931. TYPE: South Africa. Cape: *C. P. Thunberg s.n.* (holotype, UPS not seen).

The species name is descriptive of the fruit shape. The name should be used for the transfer of *Thlaspeocarpa capensis* to *Heliophila*.

Acknowledgments. We are grateful to Victoria C. Hollowell, Peter Goldblatt, Nicholas J. Turland, and an anonymous reviewer for their review and valuable comments on the manuscript.

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Tripogon debilis (Poaceae), a New Species from Western China

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ABSTRACT. A new species of *Tripogon* from western China (Sichuan Province), *T. debilis* L. B. Cai, is described and illustrated. This species is similar to both *T. chinensis* (Franchet) Hackel and *T. sichuanicus* S. M. Phillips & S. L. Chen, but distinguished from these two species by its pendent spikes, relatively long glumes and lemma awns, denticulate upper glumes, and its paleas strikingly shorter than the lemmas.

Key words: China, Poaceae, *Tripogon*.

The genus *Tripogon* Roemer & Schultes consists of approximately 30 species. One species is distributed in Australia and two in America; the remainder are in Asia and Africa. The greater number are concentrated in southern Asia, especially in India, for which Bor (1960) reported 13 species. China has 10 previously recognized species, but only 4 are endemic, and most of them occur in the mountains of western China (Keng, 1959; Keng & Liou, 1960; J. L. Yang, 1983; X. L. Yang, 1983, 1990; Phillips & Chen, 2002). Recent research on the genus in this region revealed two collections representing an unknown taxon. Thorough, immediate investigation and collection in the localities of these specimens in the summer of 2003 revealed that this taxon is different from all other species of this genus in its external morphology. Hence, it is reported as a new species here.

Tripogon debilis L. B. Cai, sp. nov. TYPE: China. Sichuan: Jiulong County, Tanggu, 3210 m, 29°6′N, 101°36′E, 23 July 2003, *L. B. Cai 0318* (holotype, HNWP; isotype, CDBI). Figure 1.

Culmi tenues, 25–34 cm alti. Spicae laxae, graciles, 8–15 cm longae. Spiculae 6–8 mm longae (aristis exclusis), 6- ad 8-flores gerentes; glumis lanceolatis, 1- ad 3-nervibus, infera integra, 2.5–3.5 mm longa, supera 4.0–5.0 mm longa, infra apicem bidenticulata; lemmate primo 3.5–4.5 mm longo (arista exclusa), nervo medio in aristam 3–4 mm longam extenso; paleis lemmatibus ca. 1.1 mm brevioribus.

Perennial herb, with thick fibrous roots. Culms erect or slightly geniculate below, smooth, caespitose, 25–34 cm tall, ca. 0.8 mm diam., 2- or 3-noded. Leaf sheaths shorter than the internodes, white-villose at abaxial sheath summit; ligules very short or nearly absent; leaf blades involute, 4–11 cm long, lower surface glabrous, upper surface scabrous or sometimes pubescent toward the base. Spikes lax, slender, pendent, 8–15 × ca. 0.25 cm; inflorescence rachis internodes glabrous, generally 5–13 mm long. Spikelets sessile, brownish green, appressed along the rachis, usually 6- to 8-flowered, 6–8 mm long (excluding awns); glumes lanceolate, glabrous, slightly membranous along the margins; lower glume 1-nerved, entire, pungent at the apex, 2.5–3.5 mm long; upper glume obscurely 3-nerved, 2 denticulate below the apex, 4–5 mm long; lemmas glabrous, lanceolate, 3-nerved; first lemma 3.5–4.5 mm long, its median vein extended into a straight awn 3–4 mm long, lateral veins extended into mucros 0.3–0.5 mm long, toothed between the mucros and the median awn; callus obtuse, with ca. 0.3 mm long hairs; paleas semi-membranous, 2-nerved, shorter than the lemmas by ca. 1.1 mm, densely ciliate along upper keels; anther 1, rarely 2 or 3, yellow, 1.3–1.5 mm long. Caryopses unknown.

Etymology. The epithet "debilis" refers to the slender spikes and culms of the new species.

Distribution and habitat. Tripogon debilis is known only from the Hengduanshan district of Sichuan Province, western China, where it grows on roadsides, wasteland, and stony slopes from 3100 to 3800 m. According to field observations, this species is locally rare.

Relationships. This new species is similar to *Tripogon chinensis* (Franchet) Hackel in its slender culms to 34 cm tall, lax and graceful spikes, short spikelets appressed to the rachis, and its lemmas with only central awns. It differs from *T. chinensis* in having pendent spikes and spikelets with 6 to 8 florets; lower glumes 2.5–3.5 mm long; upper glumes 4–5 mm long, with 2 teeth below the apex; lemma awns 3–4 mm long, and paleas being strikingly shorter than the lemmas. In addition, the general appearance of spikes in *Tripogon sichuanicus* S. M. Phillips & S. L. Chen suggests some similar-

Figure 1. *Tripogon debilis* L. B. Cai. —A. Plant. —B. Spikelet. —C. Lower glume. —D. Upper glume. —E. Lateral view of the first lemma. —F. Ventral view of the first lemma. —G. Palea. —H. Anthers. Scale bar: A = 12 mm; B = 0.17 mm; C, D = 0.13 mm; E–H = 0.11 mm. A–H drawn from the holotype (*L. B. Cai 0318*, HNWP).

ities with this species, but *T. sichuanicus* can be distinguished from this species by its erect or slightly curved spikes, lower glumes 2.1–2.7 mm long; upper glumes entire 3.5–4.3 mm long, lemmas oblong-ovate 2.8–3.0 mm long, with blunt teeth and short central awns 1.8–3.3 mm long, and its paleas being subequal to the lemmas.

Morphologically, *Tripogon debilis*, *T. chinensis*, *T. sichuanicus*, and some other species, such as *T. humilis* X. L. Yang and *T. purpurascens* Duthie, form a distinct group within *Tripogon*. Members of the group have slender spikes, entire lower glumes, the lemmas without the lateral awns (at most mucronate), and central awns that are shorter than or subequal to the lemmas. Such species as *T. bromoides* Roemer & Schultes, *T. yunnanensis* J. L. Yang ex S. M. Phillips & S. L. Chen, *T. longiaristatus* Hackel ex Honda, and *T. filiformis* Nees ex Steudel have broader spikes, lobed lower glumes, and lemmas with lateral awns as well as central awns that are longer than the lemmas. *Tripogon nanus* Keng not only has lateral and central awns longer than the lemmas, but also distinct awns on the lobes between lateral and median awns. Further research is needed to determine whether these species groups should be recognized as sections.

Paratypes. CHINA. **Sichuan:** Jiulong County, Tanggu, *Y. B. Yang 29478* (HNWP); Daocheng County, Haizhi, *Z. G. Liou 29030* (HNWP).

Acknowledgments. I thank Ma Bi-hua, Qiao Zhi-xin, and Zhang Chang-quan for assistance with fieldwork, Song Yu-zhu for preparing the excellent illustration, and Chen Chun-fang for making the holotype collection. This work was financially supported by the Systematic and Evolutionary Biology Foundation of the Chinese Academy of Sciences.

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Studies in the Capparaceae XXVI. *Capparis bonifaziana*, a New Species and Western Ecuadorian Sister to the Mostly Amazonian *C. macrophylla*

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ABSTRACT. From subgenus *Capparidastrum* s.l. (Capparaceae), *Capparis bonifaziana*, a small to medium-sized tree endemic to the western, Pacific slope of Ecuador, is newly described as an allopatric segregate of the much more widespread but rare *C. macrophylla* s. str., of the mountains and valleys of the northern Andes to the tropical lowlands of western and southwestern Amazonia. The new species differs by its more conspicuous and larger episepalous glands, smaller anthers, ovaries, and erect petals; smaller number of stamens; elliptic to oblong, rather than broadly ovate leaves; and longer and narrower baccate fruits. Both taxa are described, compared, illustrated, mapped, and with all their known specimens listed.

RESUMEN. *Capparis bonifaziana*, del subg. *Capparidastrum*, s.l., Capparaceae, es una nueva especie alopátrica, de arbolillo o árbol principalmente endémico del occidente de Ecuador, segregada de la infrecuente *C. macrophylla*, s. str., ampliamente distribuida desde las montañas y valles al norte de los Andes hasta las tierras bajas tropicales adyacentes de la Amazonía occidental y suroccidental. Esta nueva especie difiere por sus glándulas episépalas grandes y conspicuas; anteras, ovarios y pétalos erectos de menores dimensiones; menor número de estambres; hojas mayormente elípticas a oblongas antes que amplio ovadas; y frutos abayados más largos y angostos. Ambos taxones son descritos, comparados, ilustrados y mapeados, con todos los especímenes conocidos citados.

Key words: allopatric speciation, Capparaceae, *Capparidastrum*, *Capparis*, edible fruits, endemic, western Ecuador.

In the forested tropical lowlands on either side of the Andes, from Venezuela to Bolivia, there grow several taxa of *Capparis* subg. *Capparidastrum* (DC.) Eichler s.l., Capparaceae (Eichler, 1865), which are characterized by (1) pepo-like or baccate, spherical to cylindric, pendent fruits with an exocarp that is indehiscent, thick and decomposing to tardily and partially dehiscent, by 3 to 4 thinly coriaceous valves (only in *C. macrophylla*), with the many seeds immersed in fleshy pulp and/or sarcotesta; (2) racemose flowers on stiff, long, basally naked peduncles; (3) massive, fleshy calyx glands, which, sitting diagonally on top of the inside basal half of each of the sepals, strongly force the latter to reflex and so partially cover and even obscure them to a greater or lesser degree; and by (4) usually glabrous leaves of often uneven sizes, on pulvinate petioles of variable length.

Involved here are: (1) the widespread, northern Peruvian-Ecuadorian, spherical-fruited *Capparis petiolaris* Kunth, including its xeromorphic, often pubescent, narrow-leaved Peruvian ecotype, *C. prisca* J. F. Macbride, with which it thoroughly intergrades; (2) *C. coimbrana* X. Cornejo & Iltis, an allopatric Bolivian sister species of *C. petiolaris*, which mainly differs from the former by its oblongoid, edible fruits and higher number of lateral veins (Cornejo & Iltis, 2005); (3) the Peruvian *C. sprucei* Eichler, locally endemic to the arid lowlands along the Río Huallaga from Tarapotó south to the small village of Cuzco in the province of San Martín, this an extreme xerophyte with strongly coriaceous, orbicular to broadly ovate leaves; (4) a new, highly local endemic from the Río Nechi headwaters in Antioquia, northwestern Colombia (Cornejo & Iltis, in prep.); (5) the rare local *C. cuatrecasana* Dugand from Bogotá in the Colombian Andes; (6) the uncommon *C. macrophylla* Kunth s.

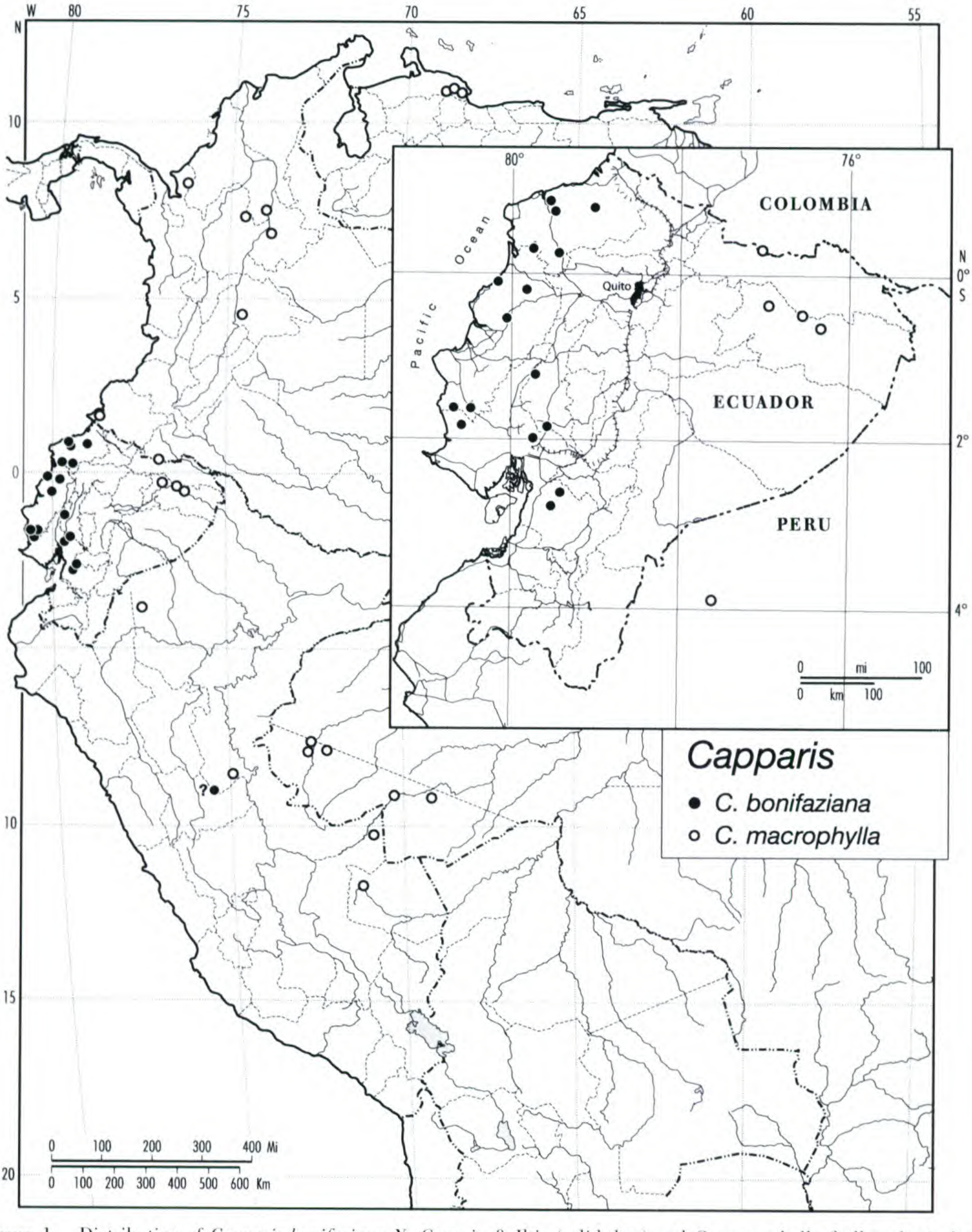

Figure 1. Distribution of *Capparis bonifaziana* X. Cornejo & Iltis (solid dots) and *C. macrophylla* (hollow dots), their ranges separated by the Andes (the isolated dot of *C. bonifaziana* in southern Peru is discussed at end of its specimen citations).

str. (Figs. 1, 3), a complex species that in one form or another ranges sporadically along the Andean arc, mostly in tropical inter-Andean valleys in the north and western Amazonia to the south in a narrow belt just east of the Andes, from northern Venezuela (incl. *C. iltisiana* T. Ruíz) and Colombia (*C. macrophylla* s. str.) to Acre in southwestern Brazil (incl. *C. magnifica* Gilg), and is characterized by often giant, broadly ovate to ovate-lanceolate leaves and oblongoid fruits; and finally, (7) the new species *C. bonifaziana* (Figs. 1, 2) an allopatric, Ecuadorian segregate of *C. macrophylla*, the subject of this paper.

Capparis macrophylla s.l. has been problematic

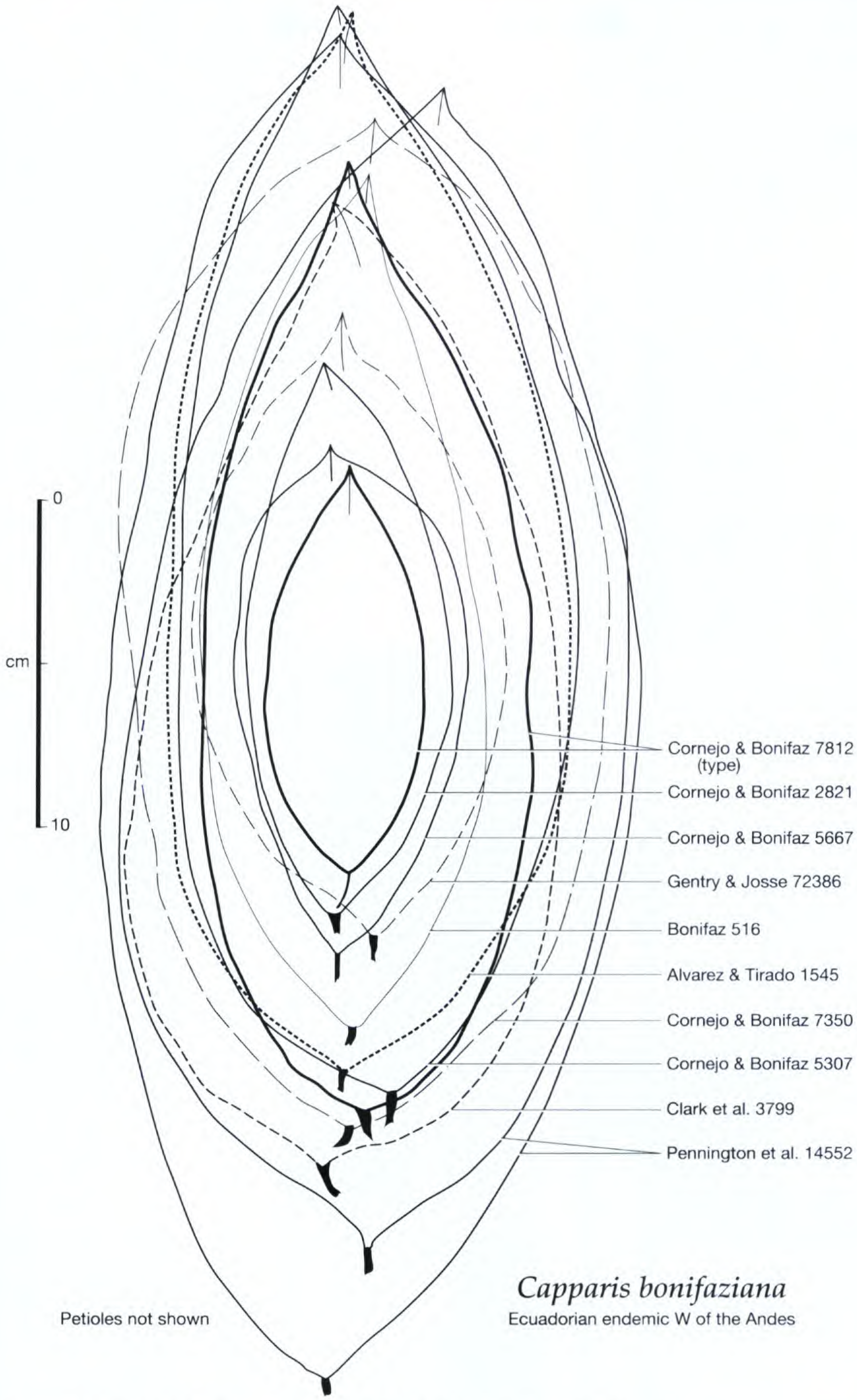

Figure 2. *Capparis bonifaziana*. Outlines of leaves of 10 collections (petioles shown).

for a long time, partly because of the confusion caused by the fact that its name had been sometimes misapplied to the widespread but distantly related *C. frondosa* Jacquin (*C. baducca* L.; Dugand, 1955: 108; Ruíz-Zapata & Iltis, 1998: 140), and, steadily since the 1890s, to the common, more closely related, smaller-flowered and much smaller-fruited *C. osmantha* Diels (incl. *C. guaguaensis* Steyermark) of mostly the tropical Amazonian forests east of the Andes. This species, in turn, is

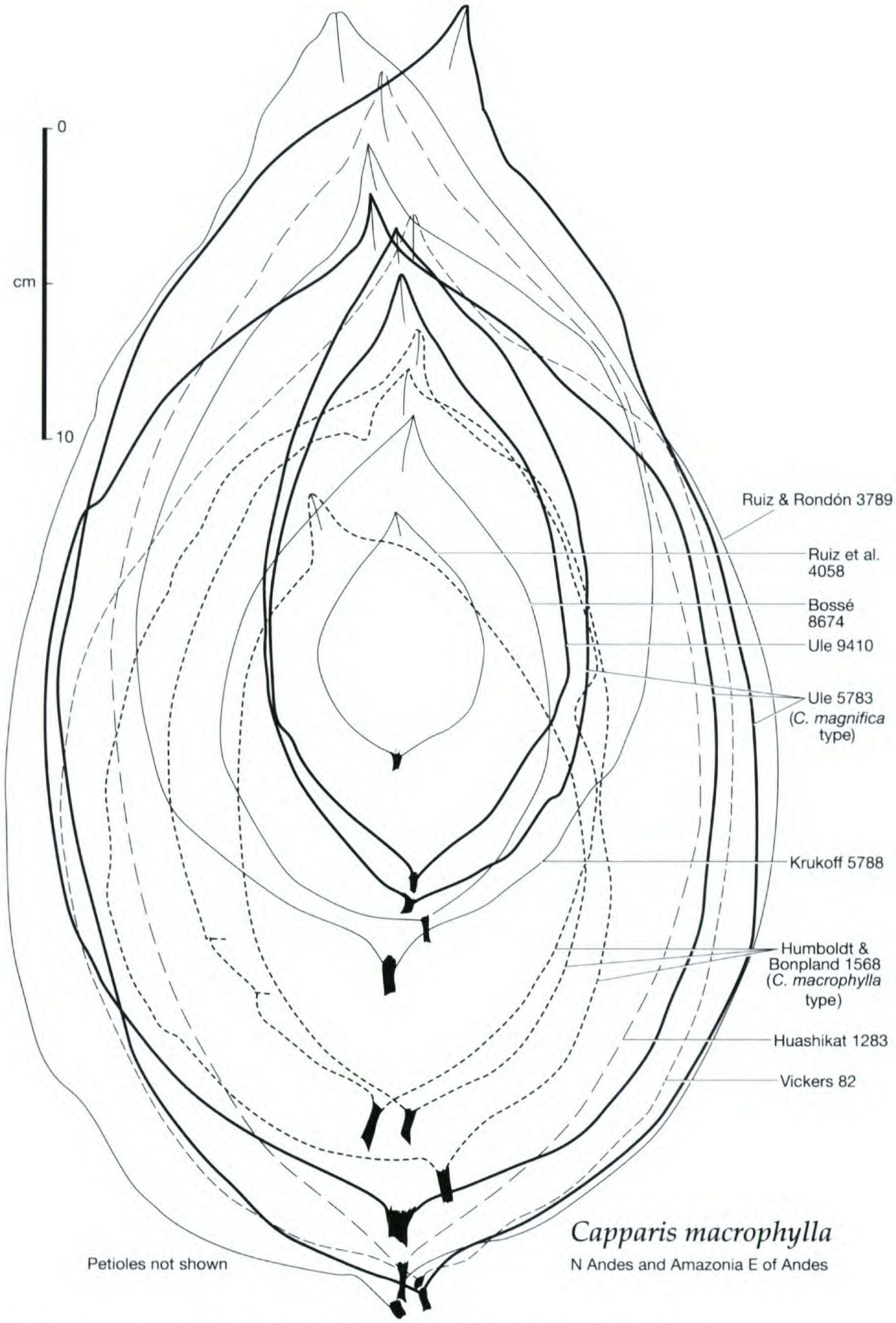

Figure 3. *Capparis macrophylla*. Outlines of leaves of 10 collections (petioles not shown).

more closely related to a Mexican–Mesoamerican alliance (Iltis, 2001; Ruíz-Zapata & Iltis, 1998) composed of *C. discolor* J. D. Smith (incl. *C. tuerkheimii* J. D. Smith and *C. uniflora* Woodson), *C. quiriguensis* Standley, and *C. mollicella* Standley (incl. *C. lankasterii* Standley), and, in Colombia, *C. cuatrecasana* Dugand.

The type specimen of *Capparis macrophylla* (*Humboldt & Bonpland 1568*, P), consisting of three leaves (cf. Fig. 3) and one flower, is not very

revealing, since these resemble leaves and flowers of some of the other taxa listed above, while the original description, based in part on Bonpland's field notes (Kunth, 1821: 91), is more helpful. In any case, since material of *C. macrophylla* from Colombia is often incomplete, the need for more ample collections, especially from the southwest of the country, is critical. Unfortunately, the fully mature, soft fruits of most of these species, but especially of *C. macrophylla*, are uncommonly collected by botanists, attractive as they are to animals and to humans who also like to eat them, and they are furthermore, much as bananas, difficult to dry and preserve. Finally, fruit size varies enormously within most species, both clinally, depending on the regional or local climate, and individually, depending on the vigor of the plant (Ruíz-Zapata & Iltis, 1998; Iltis, 2001).

Nevertheless, in preparing a treatment of Capparaceae for the *Flora of Ecuador*, and utilizing the large number of splendid specimens recently collected there, our study of all *Capparis macrophylla* collections made it abundantly clear that these could be separated on leaf shape alone into two allopatric taxa divisible by the Andes (Figs. 2, 3): narrowly oblong-lanceolate to oblong-elliptic, and acute to obtuse, from the relatively drier western Pacific lowlands, and broadly elliptic to ovate, and acuminate to short-acuminate, from the much wetter Amazonian lowlands just east of the Andes, with the latter populations matching closely in their leaf-outlines the leaves of the *C. macrophylla* type specimen from the Colombian Andes (Fig. 3). Several other characters of flower and fruit were eventually discovered, which correlated well with the seasonally dry to moist forest ecology of western Ecuador.

KEY TO *CAPPARIS BONIFAZIANA* AND *C. MACROPHYLLA*

1a. Episepalous glands 5–8 mm wide, showy and exposed by divergent to reflexed sepals; stamens 35 to 71; anthers 4.5–5.3 mm; ovary 5–8 mm; petals 19–29 mm, divergent to suberect at anthesis; fruit indehiscent. Leaf blades oblong-elliptic to oblong-lanceolate, rarely lanceolate or oblanceolate; endemic (except for one isolated collection from central Peru) to the southern half of Ecuador on the western side of the Andes, in seasonally dry to moist or *garúa* (fog) forests, from the lowlands to 850 m . . . . . *C. bonifaziana*

1b. Episepalous glands 2.5–4 mm wide, inconspicuous and hidden by the divergent to ascending sepals; stamens 80 to 130; anthers 6–7 mm; ovary 8–11 mm; petals 27–40 mm, reflexed at anthesis; fruit tardily dehiscent by 3 to 4, thin, flexible coriaceous exocarp segments. Leaf blades widely elliptic to ovate-elliptic or sometimes suborbicular; in moist to wet forests of the tropical valleys to the submontane zone of the Venezuelan and Colombian Andes, and in the low-elevation, wet, evergreen, tropical Amazonian rain forests, from southern Colombia and eastern Ecuador and Peru to Amazonas and Acre states of western Brazil, just east of the Andes . . . . . *C. macrophylla*

With *Capparis macrophylla* s. str., now more narrowly defined, the newly segregated Ecuadorian endemic is in need of a name. Because its best and most complete specimens were co-collected by Dra. Carmen Bonifaz (b. 1956), Universidad de Guayaquil Herbarium director and a long-time sophisticated student of the western Ecuadorian flora, we are most pleased to name this species in her honor.

1. **Capparis bonifaziana** X. Cornejo & Iltis, sp. nov. TYPE: Ecuador. Los Ríos Prov.: Hcda. Clementina, Puerta Negra, en "Tecal" contiguo, bosque húmedo tropical, 79°21'W, 1°40'S, 80 m, 9 Oct. 2003 (fl, fr), *X. Cornejo & C. Bonifaz 7812* (holotype, GUAY; isotypes, AAU, BM, COL, K, LOJA, MO, NY, QCA, QCNE [2], US [2], USM, WIS [7]). Figures 1, 2, 4, 5.

Haec species *Cappari macrophyllae* affinis, a qua differt foliis plerumque oblongo-ellipticis vel oblongo-lanceolatis; petalis 19–29 × 9–17 mm, erectis vel divergentibus; staminibus 35–71; glandulis nectariis crassis, 5–8 mm latis; antheris et ovariis minoribus.

Treelet or tree 3–25 m tall, to 25 cm or more DBH, unbuttressed, glabrous throughout; new branches with orbicular to linear lenticels 0.2–4 mm; stipules narrowly triangular, 1–1.8 × 0.5–0.8 mm. Leaves evergreen, spirally disposed, ca. 5 to 10 spread out near the end of current year's and/or last year's growth, with petioles and leaf blades of different lengths and sizes intermixed; petioles 0.3–15(–24) cm long; pulvinus (2–)4–12 mm, dark brown (dry); leaf blades ± coriaceous, oblong-elliptic to oblong-lanceolate, rarely lanceolate or oblanceolate, 6–45 × 3–15(–20) cm, the apex acuminate to acute or rounded and apiculate, the base rounded or obtuse to cuneate, dark green above, pale green beneath, with (7–)9–12(–15) prominent main lateral veins on each side of the midrib; leaf margin not retuse at insertion above the pulvinus, and only rarely slightly decurrent (Fig. 2). Inflorescences terminal or subterminal, erect, ebracteate racemes; peduncles ± naked, up to 21 cm long and 8 mm thick, the terminal flower-bearing portion of the axis ca. 3–12 cm long, 9- to 25-flowered; pedicels (2–)3–4(–5) cm, each subtended by a minute, caducous, triangular to linear bract and two persistent minute triangular stipules; calyx 4-parted, to 15 mm across, tip to tip; sepals ascending to somewhat reflexed at anthesis, broadly deltoid to se-

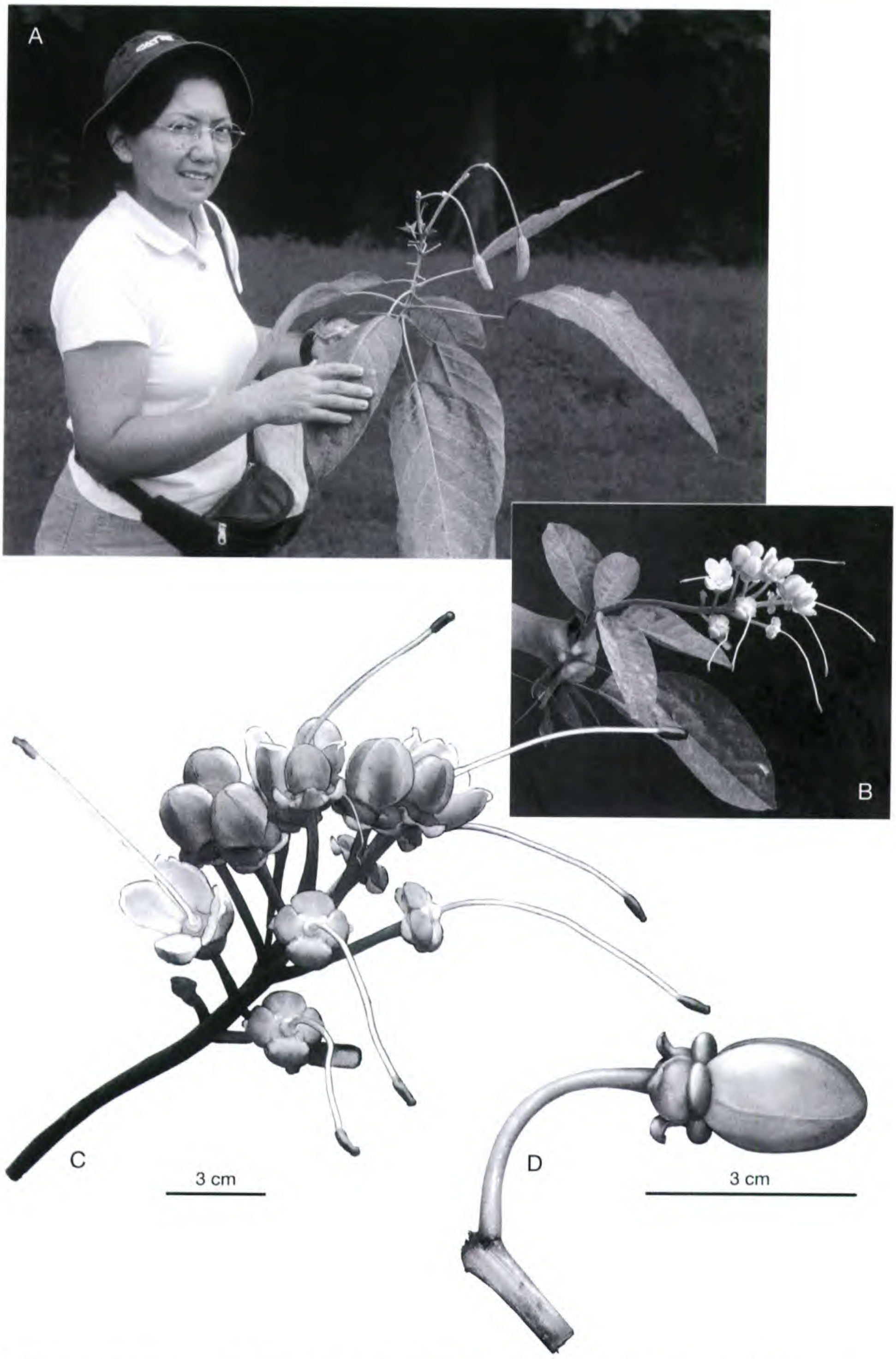

Figure 4. *Capparis bonifaziana*.—A. Carmen Bonifaz holding an immature fruiting branch of the type specimen. —B. Flowering branch, with buds and post-anthesis flowers with filaments abscissed, showing the strongly ascendent petals, large glands and ovaries on elongated gynophores. —C. The same branch as in B, enlarged. —D. Flower bud just preceding anthesis.

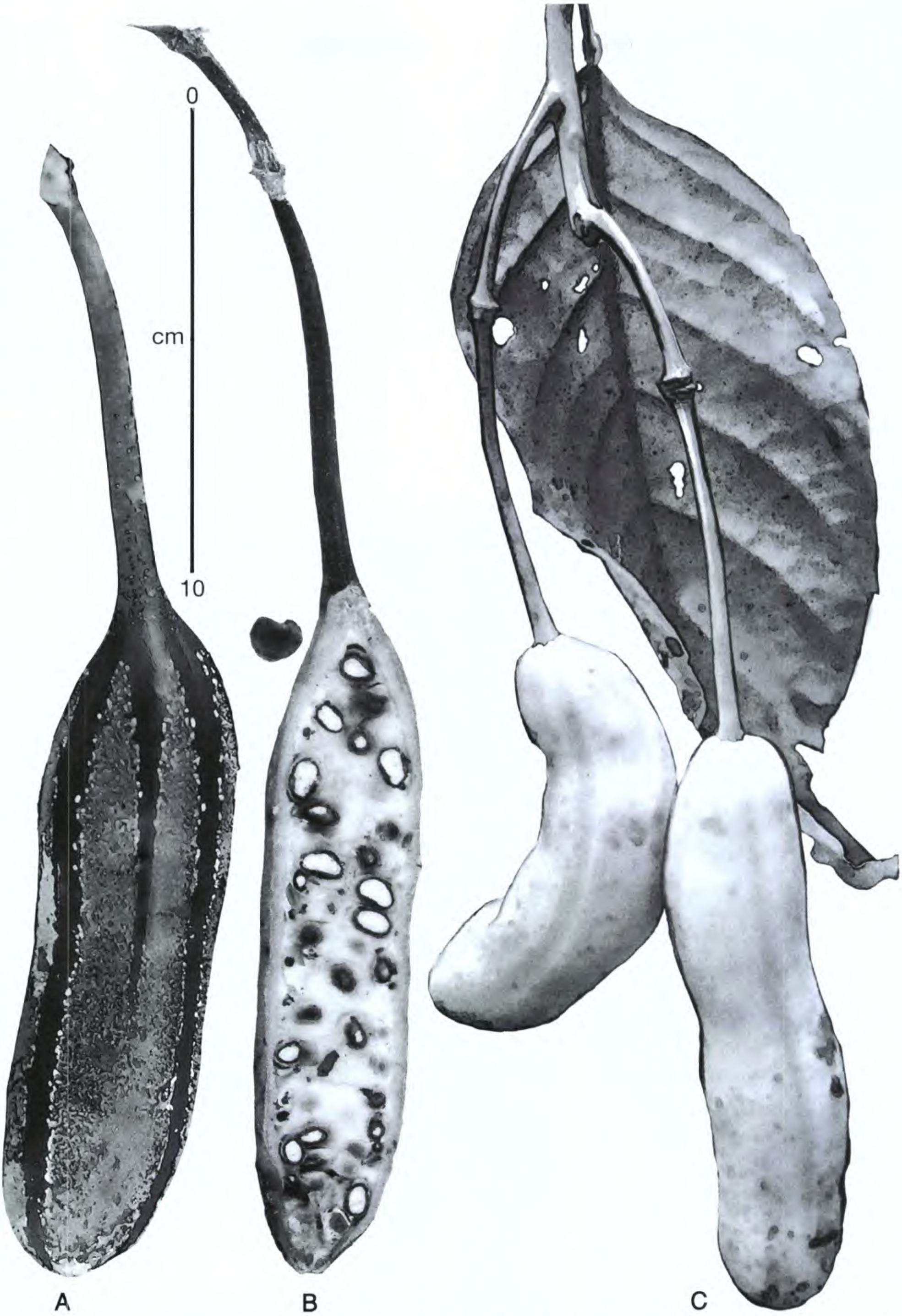

Figure 5. *Capparis bonifaziana.*—A. Nearly mature fruit with characteristic longitudinal stripes, reflecting the inner, parietal placentae. —B. Fruit in longitudinal section, showing the many seeds imbedded in a white, sweet, edible pulp. —C. Branch with two fruits and subtending leaf. A–C: type collection.

miorbicular, 4–6 × 5–9 mm, white to greenish white with white-hyaline, shallowly erose-ciliolate margins, each subtending and bearing on top of their inside base a conspicuous, relatively large (ca. 2–3 × 5–8 mm), white to pink or purple (when fresh, but drying black), episepalous gland that is fleshy, rounded, fat and cushion-shaped; flower buds just preceding anthesis obovoid, 15–25 × 18–

20 mm; petals stiff and erect to ascending or divergent, somewhat fleshy, forming a teacup-shaped corolla at anthesis, broadly ovate to elliptic, 19–29 × 9–17 mm, the apex broadly rounded and cucullate, the base subsessile by a minute peg inserted between, and inside of, the glands, greenish white without, cream to white within, the margin ± entire, minutely and irregularly erose-denticulate; stamens 35 to 71, filaments 5.5–8 cm long, anthers 4.5–5.3 mm, dorsifixed in the basal third; gynophore 6–8 cm, white; ovary 5–8 × ca. 2–3 mm, green, oblongoid to subcylindrical, sometimes longitudinally striate; stigma truncate to hemispherical, sessile. Fruits solitary or up to 6, clustered at the end of branches, pendent indehiscent and baccate, fleshy within, cylindric or oblongoid, rarely ovoid, straight to somewhat curved (banana-shaped), 7–15 × 2–4 cm, when immature the exocarp green with four dark green stripes ["resembling a squash fruit," *Steyermark 52706*], in immature herbarium material dark brown or purple-spotted with four black longitudinal stripes, at maturity yellow to orange, with 2 major and 2 minor longitudinal, grooved markings [Fig. 5; "bright yellow with faint red longitudinal lines," *Neill 11446*], eventually turning soft, or thin and coriaceous, filled with a white pulp; gynophore 7–11 × 0.3–0.6 cm, bright yellow; pedicels 3–5(–6) cm; seeds ca. 25 to 60 per fruit, each surrounded by a white aril, irregularly beveled, somewhat flattened, 10–14 × 7–8 mm (but see below); testa brown or black, the cleft invagination narrow and very short (ca. 2 mm); embryo white, the cotyledons convoluted one into the other and around the radicle, with a thin layer of endosperm visible (in cross section) on the rounded back of the seed.

Habitat and distribution. Lowlands to the premontane, fog-enshrouded mountains of western Ecuador, from Esmeraldas south to Azuay, from dry to moist tropical and (rarely wet) premontane forests, often in secondary vegetation (usually all that is now left in western Ecuador), from near sea level (50 m) to 850 m; flowering and fruiting throughout the year.

Local names. Barniz (Spanish), *Quelal et al. 472* (Esmeraldas); Cacho de Venado (Spanish), *Cornejo & Bonifaz 5667* (Los Ríos); Guineo de montaña (Valverde et al., 1991); Maduro (Spanish), *Cornejo & Bonifaz 3884* (Manabí), *Cornejo & Bonifaz 1308* (Guayas, Bonifaz & Cornejo, 2004).

Uses. Fruits edible, *Cornejo & Bonifaz 3884, 4885, 5667, 7793*; *Bonifaz & Cornejo 3085* (Bonifaz & Cornejo, 2004). Cultivated as living fences, *Alvarez & Tirado 1545.*

Biological interactions. The flowers, open from early evening until early next morning, are probably bat-pollinated, but this has as yet not been verified. During the day, flowers are visited by black bees (*Cornejo & Bonifaz 5307*) and at least five species of ants, each observed and collected on a different tree at the type locality (*Cornejo & Bonifaz 7812*).

Discussion. The vegetative differences between *Capparis bonifaziana* (Fig. 2) and *C. macrophylla* (Fig. 3) may be subtle. In addition to the overall leaf shape, *C. bonifaziana* has the blade margins inserted generally at right angles above the pulvinus, and only rarely decurrent onto the pulvinus, whereas *C. macrophylla* has leaves that are more often rounded or subcordate at the base, but then more abruptly decurrent onto the pulvinus.

Ecology. While label data tell us that *C. bonifaziana* grows in a wide range of forest types, from dry (but not very dry) to moist or even wet, associated species have never been mentioned. Here we now report two woody Capparaceae collected together with *C. bonifaziana* (*Cornejo & Bonifaz 7115*, in sched.) in remnant moist forests near Chone: *Capparis ecuadorica* Iltis (Iltis, 1978), a locally not uncommon Ecuadorian endemic shrub or treelet; and, in addition, wonder of wonders, the showy *Steriphoma urbani* Eggers (*Cornejo & Bonifaz 7350*, in sched.), a super-rare liana endemic to western Ecuador, here now at its only fourth known station, and the only white-flowered species in this small, highly specialized, otherwise orange- to red-flowered, hummingbird-pollinated genus. Its pollinating bats are yet to be discovered.

Detailed descriptions of the vegetation associated with *Capparis bonifaziana* may be found in *Flora del Bosque de Garúa de la Comuna Loma Alta, Provincia del Guayas, Ecuador* (Bonifaz & Cornejo, 2004), located in the Chongón-Colonche mountains northeast of Guayaquil. Here, the belt of dense, seasonally moist to wet, low-elevation (400–600 m) cloud forest is, like the hot super-dry coastal forests and deserts, the product of a peculiar climatic phenomenon characteristic of the west coast of Peru and Ecuador (as it is of the west coasts of South Africa and Australia), namely oceanic fog. Locally known as the *garúa*, and drifting inland from the frigid Pacific Ocean to the west, this fog of fine water droplets is the result of the chilling effects of the upwelled, cold coastal waters of the Antarctic Humboldt (or Peru) Current on the warm, moisture-

laden tropical westerlies. With its 20–30 m tall trees "milking" the clouds, such wet forests are characterized by abundant epiphytes, especially Araceae (*Anthurium* Schott, *Philodendron* Schott), Orchidaceae, Bromeliaceae, pteridophytes and mosses, and an occasional treelet of *C. bonifaziana*.

Although widespread, *Capparis bonifaziana* is relatively uncommon, the often solitary treelet or rare tree occurring in open, seasonally dry (but not very dry) to moist or even wet forests, and most often in secondary vegetation. The only exception to this rule was found at the type locality, where some 30 or more treelets were scattered in the understory of a teak or "teca" (*Tectona grandis* L. f.) plantation (a *tecal* in Spanish). This is perhaps not surprising, since most collections were made in disturbed forests or fields or intervening *arroyo* remnants. In fact, such treelets do well when planted as living fences (*Alvarez & Tirado 1545*).

Even though Los Ríos, wherein lies the type locality, is the province with both the most disturbed vegetation in all of Ecuador, with pastures and fields abutting giant plantations of bananas, and the most thoroughly studied flora of the country, with its *Flora of the Río Palenque Science Center* (Dodson & Gentry, 1978) and *La Flora de Jauneche* (Dodson et al., 1985), neither of which report a *Capparis* equivalent to *C. bonifaziana*, nevertheless its flora continues to yield botanical novelties. In these treasured forest remnants, much field exploration remains to be done before all the wild will be gone.

Finally, on the basis of geography alone, *Capparis bonifaziana* must be the remarkable species quoted below by the legendary, now much lamented taxonomist-ecologist, Alwyn H. Gentry (1945–1993), one of the second author's former students, who at age 48, together with his friend and fellow bioexplorer, the famed ornithologist Theodore A. Parker III, met a most untimely death on the *garúa*-enshrouded slopes of the Chongón-Colonche mountains in a tragic airplane accident (Miller, 1996). In their thorough, book-length survey of Conservation International's *Rapid Assesment Program* (RAP) on the *Status of Forest Remnants of the Cordillera de la Costa*, Gentry's (1992: 38) discussion of the "Dry Forest" highlights, first, the remarkable widespread abundance and diversity of Capparaceae in coastal Ecuador, and second, the discovery of an astonishingly 25 m tall tree *Capparis* that he had never seen before. This is of interest, for despite the fact that some species of the *C. macrophylla* alliance are widespread and yet not commonly collected, and Gentry had as wide a floristic experience in northwestern South America (Gentry, 1993) as almost any botanist who ever worked there, this was, he thought, the first time that he ever encountered that *Capparis*, this surely a reflection in part of the enormous, complex, and localized biodiversity so characteristic of tropical floras. While Gentry evidently had both leaves and the "ripe banana-sized, striped fruits" in his hand, he did not collect that tree, strangely enough, perhaps awed by the difficulty of cutting it down, the magnificence of its stature, or its presence in a protected area, i.e., in a National Park. Nevertheless, apparently on the morning of that same day (18 Jan. 1991), he did collect (but did not recognize) a small treelet in both flower and fruit of this very same species (*Gentry & Josse 72386*) southwest of the small village of Guale on the Río Ayampe, and only ca. 3 km from that striking tall tree at Estero Manta Blanca:

"Although there are some local peculiarities [in Parque Nacional Machalilla], the dominant families in our dry forest sample from Estero Perro Muerto are Leguminosae and Bignoniaceae (7 spp. each), just as they are in essentially all Neotropical dry forest. A noteworthy family in this region is Capparidaceae, which mostly occurs in the very driest forest and may be more dominant here than anywhere else in the Neotropics. One striking *Capparis* (of which we found only a single tree) at Estero Manta Blanca is a large tree ca. 25 m tall, among the largest for this genus. Another interesting *Capparis* discovery is that the sometimes confused *C. heterophylla* and *C. ecuadorica* show strong ecological differentiation in areas where they are sympatric [this remains to be verified, for these two species often do occur together]. I have not previously seen the large-leaved *Capparis* with edible banana-sized, striped fruits that we found at Machalilla and it may be an undescribed species" (Gentry, 1992: 38).

How right he was!

Paratypes. ECUADOR. **Esmeraldas:** Chaflú, bosque húmedo tropical, *X. Cornejo & C. Bonifaz 5307* (GB, GUAY, K, WIS); W of San Mateo, Res. For. Jardín Tropical, Univ. Téc. Luis Vargas Torres, *A. Gentry & A. Lajones 73036* (MO, QCNE, WIS photocopy); Paraíso de Papagayos, Fund. Rescate de Animales Silvestres, km 2 vía Esmeraldas–Quinindé, *J. Clark, L. Chatrou, P. Maas & C. Repetur 3799* (MO, QCNE, WIS [2]); Anchayacu, Eloy Alfaro, Mayronga, *T. D. Pennington, R. Calero, M. Guevara, L. Zambrano, G. Rodríguez & L. Veloz 14552* (K, WIS [2]); Parroquia Alto Tambo, Finca del Sr. Calderón, a 2 km del sector El Cristal, en carretera, *C. Quelal 472* (MO, WIS photocopy); Bilsa Biol. Stat., Mache mtns., 35 km W of Quinindé 5 km W of Santa Isabel, premontane wet forest, Monkey Bone trail, *J. Clark & B. Adnepos 76* (MO, QCNE, WIS [2]), *J. Clark, L. Chatrou, C. Repetur & P. Maas 3805* (MO, QCNE, WIS [2]). **Manabí:** Río Plata, ca. 50 km

NNE de Chone, remanente de bosque húmedo tropical, *X. Cornejo & C. Bonifaz 7115* (GUAY, WIS); km 12 vía Chone–Sto. Domingo, 1 km atrás de la Universidad Católica, bosque húmedo tropical, *X. Cornejo & C. Bonifaz 7350* (GUAY, QCNE, WIS [2]); 31 km N of Pedernales along new coastal hwy., ca. 2 km S of Río Mache, *D. Neill & QCNE botany interns 11388* (QCNE, WIS photocopy); 30 km S of Pedernales on coastal highway, primary forest on hills, 2 km from seashore, *D. Neill & QCNE botany interns 11293* (GUAY, MO, QCNE, WIS); 34 km N of Pedernales along new coastal hwy., near village of Chindul, *D. Neill & QCNE botany interns 11446* (GUAY, MO, QCNE, WIS); Parque Nac. Machalilla, San Sebastián, *X. Cornejo & C. Bonifaz 3884* (GUAY, K, WIS), *C. Hernández 260* (QCA); Sector entre la Bola de Oro y La Mocora, *C. Hernández 191* (QCA). **Guayas:** Guale, bosque seco tropical, *X. Cornejo & C. Bonifaz 1308* (GUAY, WIS); valley of Río Ayampe, border w/Manabí, SW of Guale, *A. Gentry & C. Josse 72386* (MO, QCNE, WIS); Cordillera Chongón-Colonche, comuna Olón, *X. Cornejo & C. Bonifaz 2821* (GUAY, WIS); Río California, bosque seco, *C. Bonifaz & X. Cornejo 3085* (GUAY, WIS). **Los Ríos:** Represa Daule Peripa, El Barro, Boca de Pescadillo, *C. Bonifaz 516* (GUAY, MO, WIS); La Puntilla, *X. Cornejo & C. Bonifaz 5667* (GUAY, WIS); Hcda. Clementina, en tecal, bosque húmedo tropical, *X. Cornejo & C. Bonifaz 4885* (GUAY, K, WIS), *X. Cornejo & C. Bonifaz 7793* (GUAY, WIS); cerro Samama, near Puerta Negra, mainly disturbed secondary forest (very common), *B. Ståhl & X. Cornejo 5828* (GB, GUAY, WIS [2]); above Río Mombe, ca. 38 km NE of Babahoyo, *B. Ståhl & J. Knudsen 1179* (GB, WIS photocopy). **Cañar/Azuay:** Hcda. Yubay, at Sanaguin, on S side of Río Patul, *J. Steyermark 52706* (NY); comuna de Manta Real, al sur de la carretera La Troncal–Zhud, camino entre Zhucay y el Río Patul, margen izquierda del Río Patul, bosque húmedo premontano, *A. Alvarez & M. Tirado 1545* (MO, QCNE, WIS). **Azuay:** 5 km SE of La Troncal on road to Zhud, beginning of track to Zhucay, *G. P. Lewis & P. Lozano 2897* (QCA, QCNE, WIS); La Conferencia y Santa Cruz, Parroquia Molleturo, *L. Ortiz 132* (QCA, QCNE). PERU. **San Martín-Loreto:** high area above Río Aguaytia, W bank 10 km below Aguaytia, small tree with paw-paw [*Asimina triloba*, Annonaceae, an edible-fruited common treelet of eastern North America]-like fruits, 4 July 1959 (fr), *M. Mathias & D. Taylor 3580* (MO, WIS photocopy).

This solitary collection from southern Amazonian Peru, at the far southern end of San Martín province and close to Tingo María, has large elliptic leaves and fruits exactly like those of *Capparis bonifaziana*, and may represent that species otherwise endemic to western Ecuador. Since this station is disjunct by fully 600 km and close to the stations of *C. macrophylla* (*Froehner 407*), we included this collection here somewhat reluctantly. Of course, such disjunction may be attributed to avian long-distance dispersal, a situation not unknown considering that these fleshy fruits evolved for animal consumption and dispersal. On the other hand, with the fruits of this species eaten by people even now, and undoubtedly by "indígenas" some several thousands of years ago, at the time of the Incas and before, there is always the possibility that some horticulturally-inclined persons took seeds or cuttings and transported them to their new home to enjoy these tasty fruits yet another day. Though the great distance and different climatic regime would seem to preclude such a scenario, as would an unlikely long-distance avian dispersal, we surely cannot discount these possibilities completely.

2. Capparis macrophylla Kunth, in HBK, Nov. Gen. Sp. 5: 91. 1821. *Capparidastrum macrophyllum* (Kunth) Hutchinson, Gen. Fl. Pl. 2: 310. 1967. TYPE: Colombia. [Bolívar]: "Crescit ad Río Viejo in ripa Magdalenae fluminis, inter Badillas [Badillo] et Bojorque [Bohórquez]," May 1802 (fl), *Humboldt & Bonpland 1568* (holotype [one leaf and one flower], P [F neg. 34627, WIS photo]; isotype [two leaves], P, WIS photocopy). Figures 1, 3.

According to Dugand (1941: 40; 1955: 108), a pioneer scholar of tropical American *Capparis*, "El sitio llamado 'Río Viejo' por Humboldt y Bonpland se halla cerca de San Pablo, abajo de Puerto Wilches, a 7°30′ de latitud norte. Badillo se encuentra a 7°57′, y Bohórquez a 7°18′ precisamente frente a Puerto Wilches."

Capparis iltisiana T. Ruíz, Ernstia 36: 1–2. 1986. TYPE: Venezuela. Edo. Falcón: Dtto. Acosta, Mun. Jacura, Cerro La Mina de Riecito, bosque submontano húmedo, selva siempreverde con afloramientos rocosos, 500 m, *T. Ruíz & F. Rondón 3789* (holotype, MY; isotypes, F [2], MY, VEN, WIS).

Shrub "with scandent branches" ("*Frutex ramis scandentibus. . .*" [Kunth, 1821: 91], this character probably based on a mistaken perception) to tree 15 m or more high and 15 cm or more DBH, with terminal branches glabrous, the lenticels prominent, orbicular to linear, 0.2–2 mm (cf. Dugand, 1955: 109), stipules ca. 1.7 mm long, narrowly triangular. Leaves evergreen, spiral, with petioles and blades of different lengths and sizes clustered near the ends of the branches; petioles (4–)8–30 × 0.1–0.3 cm; pulvini 3–24 mm long, dark brown, usually glabrous; leaf blades widely elliptic to ovate-elliptic or sometimes suborbicular, (2–)10–59 × (5–)10–34 cm, with apex acute to usually abruptly acuminate or rounded and apiculate, at base broadly obtuse to rounded and frequently shortly decurrent onto the petiole, (sub)coriaceous, dark green above with midvein and secondaries impressed to prominent, glabrous, paler green beneath with all veins prominent, with 9 to 13(to 15) main lateral veins on each side of the midrib. Inflorescences erect, terminal, ebracteate racemes, the stout peduncles 7–24 cm

long, with the flower-bearing portion 6–18 cm long, corymbiform, with ca. 7 to 14 flowers, each subtended by a minute, subulate, caducous bract ca. 1.5 × 0.7 mm, and laterally by 2 persistent minute triangular stipules, glandular with short (less than 0.1 mm), dense, colorless, uniseriate trichomes, the stout pedicels 2–6(–10) cm. Flowers greenish or white, with flower buds just before anthesis ovoid to oblongoid, 2.5–4 cm long; calyx 4-parted, in two inconspicuously imbricate series; sepals broadly deltoid, ca. 5–11 × 6–10(–15) mm, erect to somewhat divergent at anthesis, with rounded apex, greenish, with shallowly and irregularly denticulate to erose glandular margins, externally glabrous, subtending and hiding a ring of four inconspicuous episepalous, fleshy, glabrous glands ca. 1 × 2.5–4 mm; petals white, elliptic, 27–40 × 16–18(–25) mm, inserted between and inside of the glands, divergent to reflexed at anthesis, white or cream to greenish without, fleshy, longitudinally inconspicuously nerved, with margins entire to denticulate; stamens 80 to 130, filaments 5.5–10 cm, white, the anthers 6–7 mm, linear, dorsifixed in basal one third; ovary 8–11 × 2 mm, oblong to elliptic, glabrous, 3- to 4-angled, unilocular but appearing falsely 3- to 4-locular by the intrusion of 3 to 4 parietal placentae (Ruíz-Zapata, 1986), the stigma hemispherical, sessile; gynophore 7–10 cm long. Fruits pendent, fleshy, baccate [*bacca corticata*; Jackson, 1928 (reprinted 1949)], ellipsoid to oblongoid, (4–)6–14 × 2–4(–6) cm, externally yellow, glabrous, with (3 to)4 external, longitudinal, vascular markings or grooves (2 strong, 2 weak, reflecting the 4 parietal placentae inside), at maturity often tardily partway dehiscent from the tip, with the 3 to 4 thin, flexible coriaceous exocarp segments (i.e., valves) separating and recurving at full maturity (Ruíz-Zapata, 1985; *Schunke & Graham S14806*) to expose the fleshy interior; gynophore in fruit (3–)8–14 × 0.2–0.4(–0.6) cm; pedicels 4–7(–11) cm long; seeds ca. 25 to 65 per fruit, ca. 10–12 × 6–9 mm, immersed in a white to ivory fleshy pulp/aril, i.e., "Frutos. . .dehiscentes en 4 valvas, mostrando las semillas embebidas en masa cremosa de naturaleza arilar" (Ruíz-Zapata, 1985; 104–111); embryo white to cream, the cotelydons folded one into the other and around the radicle.

Habitat and distribution. In moist to wet, evergreen lowland forests of tropical inter-Andean valleys to premontane slopes of the northern Andes of Venezuela (150–1000 m) and Colombia (50–400 m), and in western Amazonia in a narrow zone on the wet, eastern side of the Andes, from southern Colombia (30 m) through eastern Ecuador (200–300 m) and Peru (200 m) to Amazonas and Acre states (100–300 m) of southwestern Brazil; flowering and fruiting more or less throughout the year.

Local name. Ecuador: "Bus su bara" (Siona; fide Reinaldo Lucitande), *Vickers 82* (Sucumbíos).

Discussion. The location of the type was specified by Dugand (1941; 1955: 108–110), who in addition gave a detailed Latin description of the two *Romero-Castañeda* (*2054, 2055*) collections, which we have not seen, yet which were not only collected close to the type locality but also according to their detailed morphological description undoubtedly refer to *Capparis macrophylla*. The taxonomic problems with *C. macrophylla* were partially discussed in our introduction. The type description was based in part on Bonpland's field notes, as mentioned, and only three leaves and one dissected flower survive in the Paris Herbarium. Its claim that it came from a "shrub with scandent branches" seems to be an error. Careful descriptions of *C. macrophylla* are found in Dugand (1955) and Ruíz-Zapata (1986). A beautiful illustration is found among the unpublished Mutis plates (No. 9 of *Capparis*) in the Madrid Herbarium and another with Ruíz-Zapata's exceptionally careful description of *C. iltisiana* (Ruíz-Zapata, 1986).

Except for Colombia (and even here), this is a rarely collected species, widely dispersed in highly isolated populations, some of which perhaps will eventually deserve taxonomic recognition once more material is available.

Additional specimens examined. VENEZUELA. **Edo. Falcón:** Dtto. Silva, hacienda El Carmen, 20 km al O de Tucacas, *A. Cardoso & R. Wingfield 188* (CORO); Dtto. Acosta, Cerro de La Mina, c. Riecito, Mun. Jacura, bosque submontano húmedo, *L. Ruíz 641* (MER, MY); ca. 2 km al ENE del P. N. Cueva de la quebrada El Toro, cerca del origen del Río Paray, *R. Wingfield & R. Smith 8808* (CORO); Dtto. Federación, carr. La Taza a la est. del P. N. Cueva de la quebrada El Toro, *T. Ruíz & M. Ruíz 4158* (MY); Par. Nac. La Cueva de la quebrada El Toro, a la entrada de la cueva, *T. Ruíz, R. Parra & N. Mariño 4058* (MY). COLOMBIA. **Antioquia:** Segovia, *E. Rentería 2305* (HUA, JAUM, NY, WIS photocopy); Santa Catalina, *G. Bossé 8674* (LE, MO, WIS photocopy). **Cundinamarca:** Tocayma [Tocaima], *M. Goudot s.n.* [9?] (P, WIS photocopy). **Nariño:** Costa del Pacífico, corr. de Herrera, cuenca del Río Mira, c. Candelillas, *J. Idrovo & H. Weber 1420e* (COL, WIS). **Putumayo:** Río San Miguel o Sucumbíos, Santa Rosa y los alrededores, *R. Schultes 3618* (GH, WIS photocopy). **Santander:** 10 leguas al S.E. de Barranca Bermeja, a 3 km de la margen izquierda del río Opon, terrenos bajos inundables, *Romero-Castañeda 5054, 5055* (COL, HUA not seen, fide Dugand, 1955). ECUADOR. **Sucumbíos:** Río Aguarico, Shushufindi, *W. Vickers 82* (F, WIS photocopy); San Pablo de Los Secoyas, path W-SW, *L. Brandbyge, E. Asanza, L. Werling, S. Leth-Nissen & F. Larrea 33310* (AAU, QCA, WIS); Est. exp.

Payamino INIAP, Reserva Florística El Chuncho, *J. Jaramillo 8363* (QCA). PERU. **Amazonas:** Huambisa, valle del Río Santiago, ca. 65 km N de Pinglo, quebrada Caterpiza, 2–3 km atrás de la com. Caterpiza, *V. Huashikat 464, 1283* (MO, WIS), *S. Tunqui 91* (MO, WIS photocopy). **Ucayali:** Prov. Coronel Portillo, Bosque Nac. Alexander von Humboldt, Pucallpa–Tingo María rd, carr. de extracción, *Ch. Froehner 407* (MO, WIS photocopy); Prov. Purus, Río la Novia, margen derecha del caserío de la com. San José, *J. Schunke & J. Graham S14806* (WIS [3]). **Madre de Dios:** Prov. Manu, Par. Nac. Manu, Río Manu, Río Cumerjali, *R. Foster & B. d'Achille 12002* (F, WIS [2]). BRAZIL. **Acre:** Río Acre, Seringal Auristella, *E. Ule 9409* (G, K, MG, WIS fragm.); B[au]m, im Seringal S. Francisco, *E. Ule 9410* (G, K, MG, WIS photo); near mouth of Río Macauhan (tributary of Río Yaco), on terra firme, *B. Krukoff 5788* (A, GH, NY, WIS).

Acknowledgments. We thank first of all Carmen Bonifaz, fellow botanist and to the first author longtime field companion in the forests of western Ecuador, who helped initiate the taxonomic concept of *Capparis bonifaziana* as a separate species; Alicia Lourteig, the former herbarium curator of the Muséum National d'Histoire Naturelle in Paris, France, for photocopies of the type of *C. macrophylla*; Rosa Rankin for helpful comments; Ted Cochrane for the very careful reading of the manuscript; Lupita Sánchez for whetting the text to perfection; and finally, the ever helpful Kandis Elliot, artist of the UW Botany Department, for the expert and inspired illustrations.

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Eysenhardtia officinalis (Leguminosae, Papilionoideae), una Especie Nueva de México

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Resumen. Se describe e ilustra *Eysenhardtia officinalis* (Leguminosae, Papilionoideae), una especie nueva de México. *Eysenhardtia officinalis* guarda similitud con *E. polystachya* (Ortega) Sargent y *E. texana* Scheele, pero difiere en el número y morfología de los folíolos, inflorescencias más largas, la morfología de la flor y del fruto, así como una distribución altitudinal menor. Se incluye un cuadro comparativo para distinguir las especies cercanas a este nuevo taxón.

Abstract. *Eysenhardtia officinalis* (Leguminosae, Papilionoideae), a new species from Mexico, is described and illustrated. This species appears similar to *E. polystachya* (Ortega) Sargent and *E. texana* Scheele, but differs in the number and morphology of the leaflets, the longer inflorescences, the flower and fruit morphology, and in altitudinal distribution. A table for comparing related taxa is also provided.

Key words: *Eysenhardtia*, Hidalgo, Leguminosae, Mexico, Papilionoideae, San Luis Potosi, Veracruz.

El género *Eysenhardtia* Kunth (Leguminosae, Papilionoideae) ha estado conformado por 14 especies (Pennell, 1919) y más recientemente por 11 especies y 2 variedades (Lang, 1972; Lang & Isely, 1982). Barneby (1982) incluye al género en la Tribu Amorpheae, y considera alrededor de 10 especies. Se trata de un género restringido principalmente a México, con excepción de *E. texana* Scheele, *E. orthocarpa* (A. Gray) S. Watson y *E. spinosa* A. Gray que se distribuyen hasta el sur de E.U., así como de *E. adenostylis* Baillon que se extiende a Guatemala y El Salvador. A algunas especies se les han atribuido propiedades diuréticas como ocurre con: *E. texana*, *E. polystachya* (Ortega) Sargent y *E. adenostylis*.

En los tratamientos taxonómicos del género se han considerado como caracteres importantes la simetría del cáliz (tomando en cuenta la forma y tamaño de los dientes), el tamaño de las hojas, el número de folíolos, el tamaño de las glándulas en los folíolos (visibles en el envés), la relación de longitud entre pétalos y cáliz, el tamaño de las estipelas (en función de la longitud del pecíolo), el tamaño, forma y posición de los frutos y la presencia de glándulas en el estilo (Lang, 1972; Lang & Isely, 1982; Pennell, 1919).

Durante la elaboración del tratamiento taxonómico que se realiza para el género *Eysenhardtia* Kunth en el Herbario Nacional de México (MEXU), se detectó una entidad que difiere de las ya conocidas para este género, por lo que se propone como una especie nueva, que se describe a continuación:

Eysenhardtia officinalis R. Cruz & M. Sousa, sp. nov. TIPO: México. Veracruz: Mpio. Dos Ríos, Pachuquilla, 14.9 km al SO de Conejos, 16.7 km al SO de Puente Nacional, camino a Las Bajadas, 19°14′8.1″N, 96°37′5.3″O, 366 m.s.n.m., 4 Nov. 2001 (fl, fr), *Ramiro Cruz Durán, Esteban Martínez Salas & Clara Hilda Ramos Álvarez 5459* (holotipo, MEXU; isotipos, FCME, IEB, MEXU, MO). Figura 1.

Arbor vel frutex (1.5–)2–4 m altus; folia (5.5–)7.4–13(–14.5) cm longa; foliola (43–)45–65, margine revoluta, subtus duobus tipis glandularum uniformiter obsita; racemi (7–)10–19 cm longi; petala calycem superantia ad duplo; legumen 6.5–7 mm longum, (1.5–)1.7–2 latum, ascendens, falcatum, turgidum.

Árboles o arbustos de (1.5–)2–4 m de alto; corteza lisa, amarillo pajizo, ramas jóvenes pubescentes y con glándulas cónicas. Hojas (5.5–)7.4–13(–14.5) cm de largo, estípulas (3.5–)4.5–10 mm de largo, subuladas, pubescentes, glandulares, articuladas hasta (0.8–)1(–1.2) mm, con una glándula ovada en la base; pecíolo 0.4–0.9(–1.2) cm de lar-

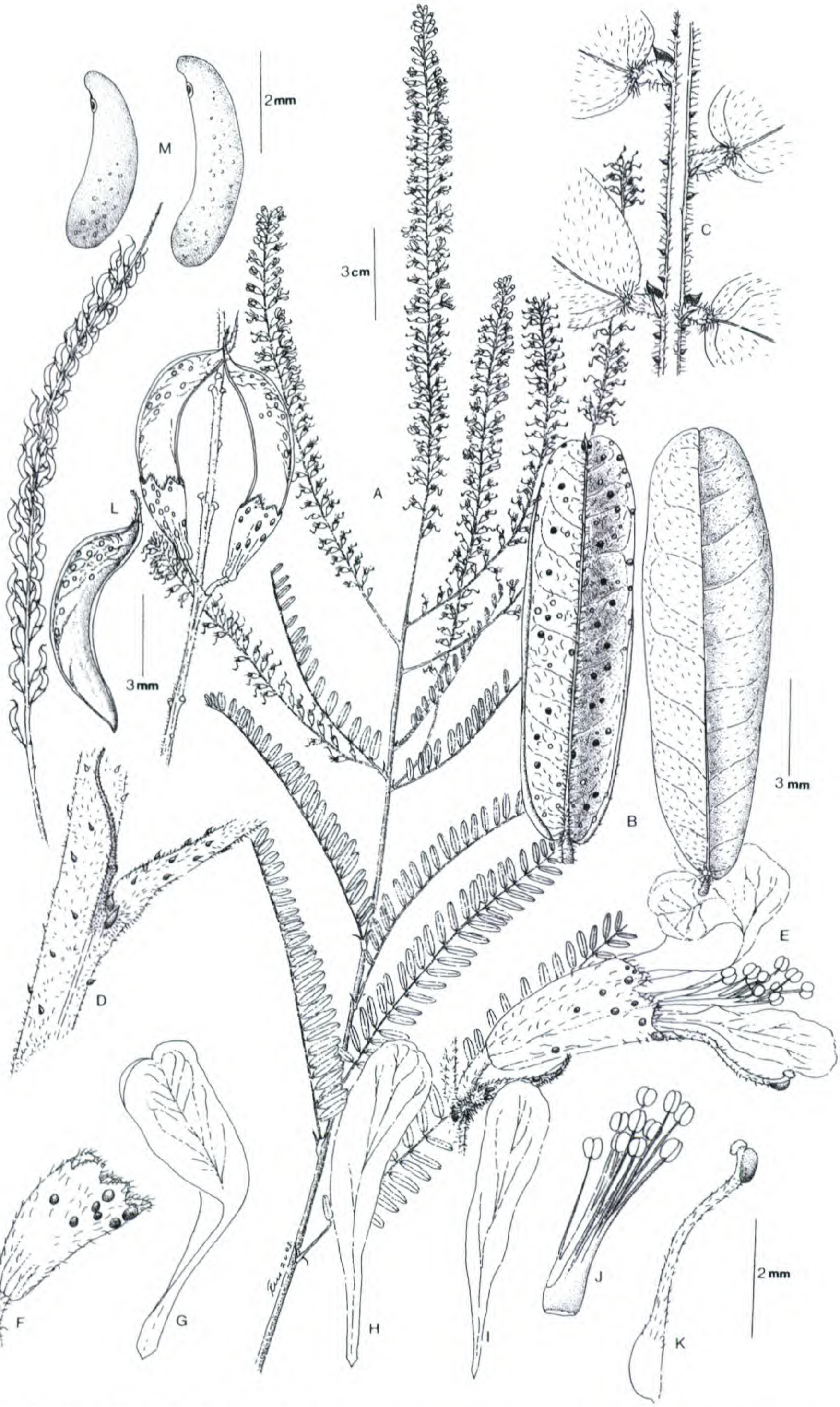

Figura 1. *Eysenhardtia officinalis* R. Cruz & M. Sousa, sp. nov. —A. Rama con inflorescencias. —B. Folíolo, haz y envés. —C. Raquis, estipelas y glándulas. —D. Estípulas y base del pecíolo. —E. Flor. —F. Cáliz. —G. Estandarte. —H. Ala. —I. Quilla. —J. Androceo. —K. Pistilo. —L. Frutos. —M. Semillas. (A–K, holotipo, *R. Cruz D., E. Martínez S. & C. H. Ramos A. 5459* (MEXU); L, M, *M. Riba s.n.* (FCME, MEXU)).

go, con pubescencia blanca, con numerosas glándulas cónicas; raquis acanalado, pubescente con glándulas cónicas a ambos lados; estipelas subuladas, 0.1–0.2 mm de largo, pubescentes, menores en longitud al peciólulo; peciólulo 0.5–1 mm de largo, pubescente; folíolos (43–)45–65, (7–)9–14 × 2.4–3.8(–4) mm, opuestos a subopuestos, oblongos, base oblicua, ligeramente cordada, ápice truncado, margen revoluto, haz pubescente con pelos cortos, vena media hendida (dándole apariencia carinal al folíolo), venas secundarias prominentes, envés pubescente con pelos largos, más evidentes en la vena media, glándulas de dos tamaños, distribuidas de manera uniforme. Racimos (7–)10–19 cm de largo, axilares solitarios o terminales a modo de panícula (en ocasiones un solo racimo terminal), pedúnculo pubescente. Flores 5–6 mm de largo; brácteas 1.5–2 mm de largo, lanceoladas, pubescentes en ambas caras, con 3–4 glándulas en el envés, justo abajo del punto de inserción con el raquis se presenta un conjunto de pelos largos a modo de mechón y en ocasiones también se presentan dos glándulas laterales prominentes; pedicelo 0.5–1 mm de largo, cilíndrico, pubescente; tubo del cáliz 2.1–2.5(–2.6) mm de largo, campanulado, pubescente, con glándulas prominentes, generalmente hacia el lado carinal, base del cáliz engrosada, a manera de anillo con costillas prominentes en la articulación con el pedicelo, los lóbulos del cáliz verdosos, 0.4–0.5 mm de largo, con margenes ciliados, interior del cáliz pubescente, al menos en la mitad superior; corola 4.5–6 mm de largo, blanca, pétalos membranáceos (menos del doble de la longitud del cáliz), el estandarte emarginado, 5.5–6 × 1.6–2 mm, la uña (1.2–)1.4–1.7 mm de largo; ala 5.2–5.8 × 1.3–1.6 mm, la uña (1.3–)1.6–1.7 mm de largo; quilla 4.8–5.6 × 1.2–1.4 mm, la uña 1.4–2 mm de largo; androceo 5–5.5 mm de largo, parte connata (1.1–)1.5–2 mm en longitud, filamentos verdosos; el pistilo 5–5.3 mm de largo, ovario 1–1.2 mm de largo, glabro, verde, el estilo 3.8–4 mm de largo, exerto, recto, pubescente, con una glándula translucida en el doblez de 0.5–0.7 mm, el estigma ligeramente capitado, verde. Legumbres 6.5–7 × (1.5–)1.7–2 mm, pediceladas, ascendentes, falcadas, turgentes, con glándulas prominentes y algunos tricomas hacia la parte dorsal, con cáliz persistente (este sin abertura dorsal), densamente aglomeradas y aplicadas al raquis. Semilla una por fruto, péndula, 3.8–4 × 1.1 × 0.9 mm, oblongo-falcada, testa café-negra, gruesa, brillante, punctulada, el micrópilo prominente.

Nombre común. "Taray" (Veracruz, *Villanueva 1*); "Chiilab" (Huasteco, San Luis Potosí, *Alcorn 2147, 2037*).

Fenología. Florece en (septiembre) octubre–noviembre (diciembre), fructifica en (octubre) noviembre–diciembre.

Altitud. (150–)200–477(–550) m.

Distribución. En Veracruz las poblaciones conocidas de *Eysenhardtia officinalis* son abundantes y se presentan de manera continua en suelo negro sobre sustrato calizo, y ocupan una extensión de aproximadamente 20 km^2. La especie se distribuye en selvas bajas caducifolias, se le encuentra asociada a especies de *Mucuna* Adanson, *Porophyllum* Guettard, *Caesalpinia cacalaco* Bonpland, *Russelia* Jacquin, *Indigofera* L., *Acacia* Miller, *Leucaena* Bentham, *Acacia cornigera* (L.) Willdenow, *Desmodium* Desvaux, *Aeschynomene* L., *Centrosema* (DC.) Bentham y Graminae. Se presentan también individuos aislados en pastizales o zonas perturbadas, en remanentes de selva mediana, asociada con gramíneas. En el estado de San Luis Potosí se le ha encontrado en selva alta perennifolia, asociada con *Sabal mexicana* Martius y en el estado de Hidalgo, con *Calliandra houstoniana* (Miller) Standley y *Leucaena pulverulenta* (Schlechtendal) Bentham.

Epíteto específico. El nombre de esta especie hace alusión al uso medicinal que se le ha dado principalmente en la zona de Plan del Río, Veracruz, México.

Usos. Porciones del tallo, junto con la corteza, son colocados en un recipiente con agua, así saturan el líquido de un color amarillo pálido que al contacto con la luz se torna azul fluorescente. Esta infusión se ingiere como agua de tiempo. En Plan del Río, Veracruz se sabe del uso y comercialización de la madera y corteza de esta especie contra afecciones del riñón y diabetes, al menos por los últimos 20 años, también se usa como cerca viva.

En la etnobotánica huasteca las hojas se utilizan en afecciones de riñón, la corteza en tratamientos veterinarios y la madera en la obtención de colorante, así como en la elaboración de utensilios de labranza y fabricación de muebles (Alcorn, 1984).

Eysenhardtia officinalis difiere claramente de *E. polystachya* y *E. texana*, por una mayor longitud de sus hojas, un mayor número de folíolos, estípulas más largas, estipelas más cortas (casi nulas), racimos más largos, y los pétalos menos del doble de la longitud del cáliz. Por otro lado, la distribución altitudinal de esta nueva entidad es menos de 600 m, a diferencia de las otras dos que prosperan por

Cuadro 1. Comparación entre *Eysenhardtia officinalis* y especies afines.

	E. polystachya	*E. texana*	*E. officinalis*
Hojas, longitud (cm)	2–11	3–10	(5.5–)7.4–13(–14.5)
No. folíolos	29–61	15–47	(43–)45–65
Folíolos, tamaño (mm)	4–14 × 2–4	4–13 × 2–3.8	(7–)9–14 × (2.4–)2.5–3.8(4)
Estípulas, longitud (mm)	1.2–5.2	1.5–5.5(–6.5)	(3.5–)4.5–10
Estipelas, longitud (mm)	0.3–1.4, subigual o mayor al peciólulo	0.2–0.8, menor o igual al peciólulo	0.1–0.2, menor al peciólulo
Racimos, longitud (cm)	4–14	3–11	(7–)10–19
Pétalos, longitud (mm)	4–9, más del doble de la longitud del cáliz	5–8, el doble de la longitud del cáliz	4.5–6.0, menos del doble de la longitud del cáliz
Tubo del cáliz, longitud (mm)	2–4.2	2–4	2.1–2.6
Estilo, longitud (mm)	3–4	2.5–3	3.8–4
Legumbre, tamaño (mm)	9.5–15.5 × 2–4	6–13 × 2.3–2.6	6.5–7 × (1.5–)1.7–2
Legumbre, forma y posición	aplanada, recta, refleja, cáliz persistente con abertura dorsal	túrgida, ascendente, cáliz persistente con abertura dorsal breve	túrgida, falcada, ascendente, cáliz persistente sin abertura dorsal
Semilla, tamaño (mm)	4.5–5.5 × 2 × 0.6	3.2–3.7 × 1.4–1.6 × 0.9	3.8–4 × 1.1 × 0.9
Testa de la semilla	café, lisa	café, lisa	café-negra, punctulada
Floración (período)	jun.–oct.	abr.–nov.	(sep.)oct.–nov.(dic.)
Fructificación (período)	ago.–ene.	may.–dic.	(oct.)nov.–dic.
Vegetación	pino–encino. chaparral, matorral de mezquite	matorral halófilo, bosque de *Juniperus*, bosque de *Quercus*, matorral submontano	selvas baja a mediana caducifolias y alta perennifolia
Altitud (m.s.n.m.)	(1000–)2000–2600(–3200)	1000–1600(–2500)	(150–)200–477(–550)

arriba de los 1000 m; asimismo, la especie nueva crece en diferentes tipos de vegetación (Cuadro 1).

Si bien pareciera que *E. officinalis* guarda una mayor relación con *E. texana*, resulta evidente que la disposición de las glándulas en el envés de los folíolos no es igual, pues, aunque en ambas entidades se presentan glándulas de dos tamaños, en *E. texana* las glándulas de mayor tamaño conforman una línea a ambos lados de la vena media, así como en el margen, mientras que en *E. officinalis* adoptan una distribución irregular o dispersa. Aunque en ambas especies se presentan frutos ascendentes, en *E. officinalis* éstos son considerablemente falcados y túrgidos, con cáliz persistente, pero sin abertura dorsal, aunado a la presencia de semillas café-negras y visiblemente falcadas.

Lang (1972: 204) menciona que: "Like most other species of *Eysenhardtia*, it [*E. texana*] hybridizes with *E. polystachya*. My primary evidence for this viewpoint, as stated elsewhere, is that intermediate forms are found in areas where the two come together, and only in these areas. However, two specimens [one of these probably *Purpus 5638*] from northern Veracruz (beyond the range of *E. polystachya*), intermediate in fruit shape and leaflet glands between these species, may provide minor exception to this generalization." Considerando esto, en nuestras observaciones de campo, principalmente en las cercanías de Cerro Gordo en el estado de Veracruz (sitio donde prospera una población bastante grande de *E. officinalis*), no se encontró ninguna de las otras especies (*E. polystachya* o *E. texana*), por lo que se desecha la posibilidad de que se trate de una población híbrida.

Paratipos. MÉXICO. **Veracruz:** Mpio. Dos Ríos, 29.3 km al SE de Xalapa, cercanías de Cerro Gordo, *R. Cruz D., E. Martínez S. & C. H. Ramos A. 5403* (FCME, MEXU); 3.48 km al SE de Plan del Río, desviación a Actopan, carr. Xalapa–Veracruz, *R. Cruz D. et al. 5434* (FCME, MEXU); entre Rancho El Diamante y Rancho El Capulín, camino a Misantla, *R. Cruz D. et al. 5437, 5437 bis* (FCME, MEXU); km 28 carr. Fed. Xalapa–Veracruz, 30 km al E de Xalapa, cercanías de Cerro Gordo, *R. Cruz D. et al. 5359, 5364* (FCME, MEXU); Plan del Río, *M. Riba s.n.* (FCME, MEXU), *R. Villanueva G. 1* (MEXU); El Carrizal, *F. Ventura A. 2823* (DS, MICH, NY); El Aguaje, *F. Ventura A. 9098* (MO); Cerro Gordo, *F. Ventura A. 2606* (DS, NY, MICH); Mpio. Emiliano Zapata, carr. Carrizal–Los Baños, km 4.5, *G. Castilleja 7* (F); carr. Xalapa–Veracruz, desviación para Los Baños del Carrizal, *J. I. Calzada 2056* (NY, UC); Barranca de Santa María Zacuapan, *C. A. Purpus 5638* (UC); Hato de La Higuera, *C. A. Purpus s.n.* (DS); Mpio. Actopan, Idolos, *F. Ventura 19231* (MEXU); sin Mpio. 10.1 mi. W of El Tamarindo on Hwy. 140, *Seigler, Nickrent & Berlocher DS 12227* (NY). **Hi-**

dalgo: Huejutla y Macuxtepetla, camino a Xaltocán, *H. E. Moore 2243* (GH); Huejutla de Los Reyes, 6 km al SO, carr. 105 a Pachuca, *C. H. Hughes 1860* (MEXU, MO, NY, TEX). **San Luis Potosí:** Mpio. San Antonio, Tanjasnec, *J. B. Alcorn 2147* (MEXU, TEX); Lejem, *J. B. Alcorn 2037* (TEX); El Salto, 2 km al S, *R. Grether & H. Quero 750* (CAS, MEXU).

Agradecimientos. A los Biólogos Esteban Martínez Salas y Clara Hilda Ramos Álvarez del Herbario Nacional de México (MEXU), Instituto de Biología, UNAM, por llamar la atención sobre la existencia de este taxón. A la M. en C. Martha Martínez Gordillo por la diagnosis en Latín. Al personal técnico de Herbario Nacional (MEXU) por permitir la consulta del material de herbario. A los revisores del manuscrito por sus acertadas sugerencias. A la Dra. Martha Riba sus valiosas colectas.

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Protium aidanianum, a New Species from Western Amazonia. Studies in Neotropical Burseraceae XII

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ABSTRACT. *Protium aidanianum* (Burseraceae), a distinctive new species from western Amazonian Ecuador and Peru, is described, illustrated, and discussed. It resembles *P. nodulosum* Swart because of its large, coriaceous leaflets and large, brownish, substipitate, lenticellate fruits, but the new species has leaves 5- or 6-jugate (vs. 2- to 4-jugate), lateral leaflet base truncate to slightly cordate (vs. usually acute), inflorescence shorter than the petiole of the subtending leaf, flowers 4-merous (not 5-merous), petals glabrous and not persistent in fruit (vs. pubescent and often persistent and reflexed in young fruits), pistillode glabrous, and fruit larger and with rounded (vs. acuminate) apex. It resembles *P. glabrescens* Swart due to its robust branchlets, the inflorescence shorter than the petiole of the subtending leaf, and the petiole often turning black and exfoliating, but the new species differs by its deeply canaliculate petiole, higher-order venation impressed adaxially, shorter pedicel, petal margin long-papillate, and fruit brown or coffee-colored and much larger. The fact that only 1 of the 16 collections known to date has flowers highlights both the difficulty of finding flowering material and the need to actively seek it, particularly for dioecious tropical trees with small green flowers.

Key words: Amazonia, Burseraceae, Ecuador, Neotropics, Peru, *Protium*.

Documentation of the Neotropical flora has improved significantly over the past 30 years, but the increase in collections of new taxa and progress toward more realistic distribution records has not been matched by an increase in the proportion of systematically useful collections. Particularly in light of the recent surge in developmental studies for phylogenetic work (e.g., Costello & Motley, 2001), adequate representation of a species ultimately requires collections for every developmental stage of inflorescences, flowers, and fruits, as well as seeds, germinating seeds, and seedlings.

As in many tropical tree groups, the flowers of Burseraceae are small, green (usually), and unisexual (most), the latter implying the need for flowering material from both staminate and pistillate individuals. Moreover, for many taxa the flowers persist only a short time. The net result is that tropical systematists have cabinets full of new taxa represented by material insufficient for full description and therefore publication. Two strategies can compensate for this: first, botanists collecting tropical trees should always use binoculars to assist in location of flowering trees; and second, phenological studies often help to catch trees that have short flowering phases. Meanwhile, the following new species from Amazonian Ecuador and Peru is represented by 16 collections, but 3 are sterile, 12 have fruits (most with immature fruits), and 1 has buds and a few staminate flowers only.

Protium aidanianum Daly, sp. nov. TYPE: Ecuador. Napo: La Joya de los Sachas, Pompeya, S side of Río Napo, Río Jivino, Maxus Camp, km 5–7 Maxus Road, 00°25'S, 76°37'W, 220 m, 22–24 Aug. 1992 (fl), *A. Grijalva & E. Gudiño 2* (holotype, NY [2]; isotypes, MO, QCNE). Figure 1.

Arbor mediocris vel grandis foliola grandia coriacea fructus grandis bruneolus lenticellatus a *P. noduloso* foliolis 5–6-jugatis (non 2–4-jugatis) inflorescentia petiolo breviore floribus 4-partitis (nec 5-partitis) petalis glabris fructu grandiore apice rotundo differt. A *P. glabrescenti* nervis tertiariis adaxialibus impressis pedicellis brevioribus petalis longo-papillatis fructu grandiore bruneolo (nec rubello) differt.

Tree, reproductive height (6)10–30 m × 12–50 cm; buttresses present at least sometimes ("high" in *Pinkley 478* in sched., at base in *SEF 10367*); *bark* gray-green, smooth, outer bark 2 mm thick on small trees (*SEF 10367*), inner bark yellow-brown; *branchlets* robust, to 1.5 cm diam. proximal to apex; *trichomes* of four types: malpighiaceous hairs with lateral length ca. 0.2 mm; fine erect "bristles" to 0.05 mm long (to 0.1 mm on adaxial midvein); capitate glands; and thick golden appressed hairs to 0.1 mm long, these mostly at inflorescence branching points. *Leaves* 5- to 6-jugate, 43–90 cm long; petiole 7–31 cm × 6–9 mm, toward the base deeply

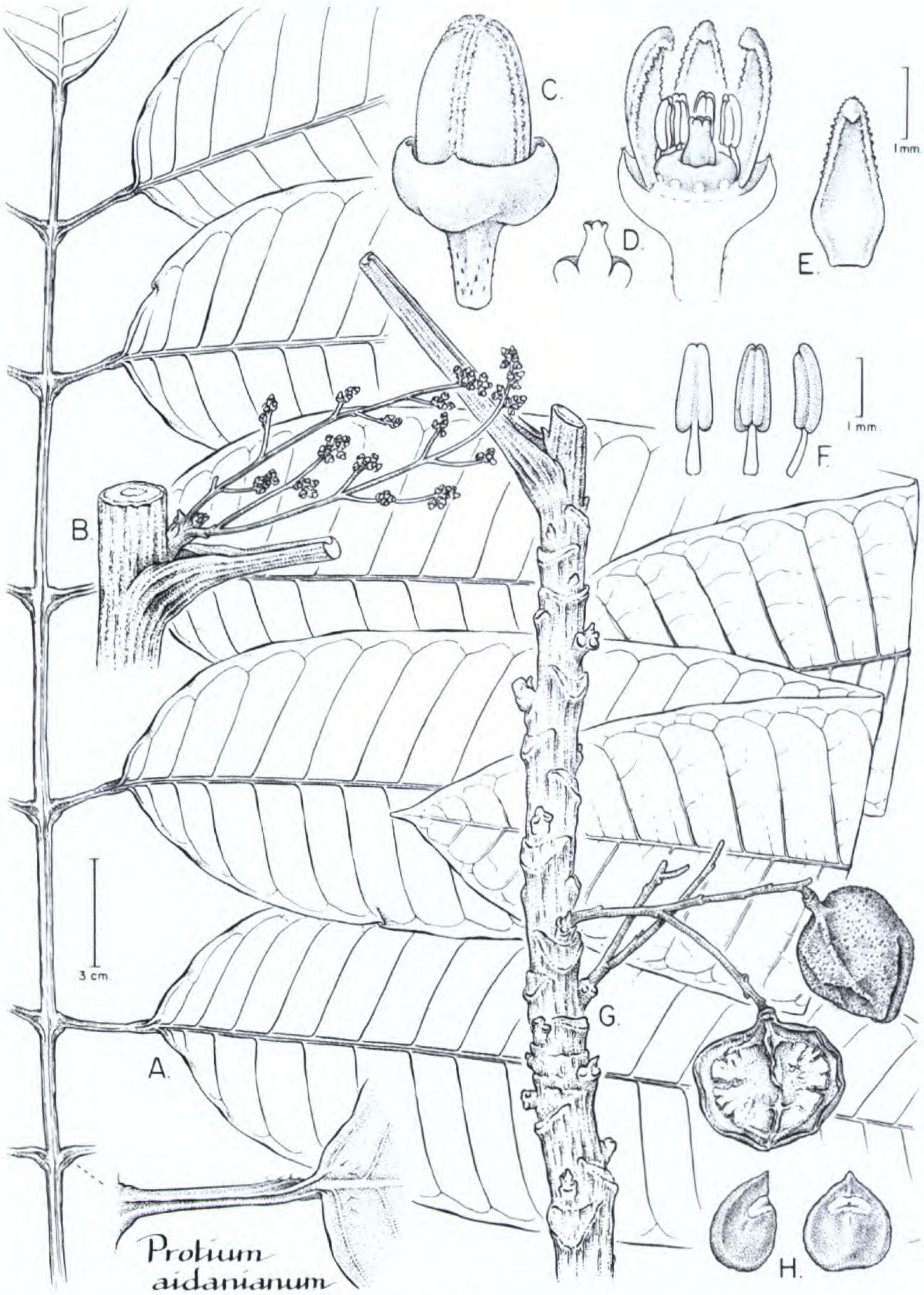

Figure 1. *Protium aidanianum* Daly. —A. Portion of leaf, with inset showing detail of petiolule. —B. Young inflorescence arising from leaf axil. —C. Staminate bud. —D. Staminate flower with part of calyx, one petal, and four stamens removed (right), and longisection of disk and pistillode (left). —E. Adaxial view of petal. —F. Dorsal, ventral, and lateral view of stamen. —G. Fruiting branchlet with leaf removed. —H. Lateral and ventral views of pyrene. (Based on *A. Cerón 3464, Grijalva & Gudiño 2, Tunqui 251.*)

canaliculate and broad (nearly semi-clasping), often lenticellate; interjuga 2–7 cm long, petiole and rachis provided with sparse to scattered malpighiaceous hairs, usually with sparse to scattered bristles, and sometimes with sparse glands, in fruit the petiole and rachis sometimes partly glabrescent, when dry the epidermis black and exfoliating in many spots; lateral petiolules robust, 0.8–3.2 cm long, with a conspicuous pulvinulus at distal end, terminal petiolule 3.5–6.3 cm long; leaflets coriaceous, drying yellowish brown, the laterals 13.5–38.3 × 5.5–12 cm, the basal pair (broadly) elliptic to oblong-elliptic, other laterals oblong to oblong-elliptic; terminal leaflet 17.5–31 × 8–11 cm, oblong-elliptic to slightly oblanceolate, leaflet apex abruptly and narrowly acuminate, the acumen (0.2)0.6–1.5 cm long, leaflet base subequal, on laterals truncate to slightly cordate, on the terminal one obtuse to slightly cordate, the midvein acutely prominent abaxially, the remaining vein orders prominulous, the midvein and secondary veins provided abaxially with scattered to sparse bristles (sometimes to 0.1 mm long) and sometimes scattered thick appressed hairs; the midvein prominulous but sunk in a groove adaxially, remaining vein orders impressed (sometimes the tertiary and higher

orders flat), the midvein provided with scattered bristles to 0.1 mm long as well as capitate glands. *Inflorescences* (Fig. 1B) (3.3)5–15.5 cm × 0.3–0.4 mm (× 3.5–4 mm in fruit), shorter than petiole of subtending leaf, secondary axes to 4.5 cm long, axes provided with sparse to scattered malpighiaceous hairs and sparse bristles, sometimes also with sparse glands; bracts on primary inflorescence axes (1)1.3–2 mm long, subulate to ovate, bracteoles subtending flowers 0.3–0.5 mm long, subulate, the bracts densely provided with thick appressed hairs; flowering pedicel 0.7–1.5 × 0.3–0.4 mm, provided with scattered malpighiaceous hairs and (at the base) sparse bristles and capitate glands. *Staminate flowers* (Fig. 1C–F) 4-merous, ca. 3.3 mm long overall at anthesis; calyx ca. 1–1.2(1.4) × 2.1–2.4 mm overall, deeply cupular and slightly urceolate, exceeding the disk, the lobes (0)0.2–0.3 mm long, rounded perdepressed-deltate or sometimes reduced to an apiculum, calyx glabrous except the lobe apices long-papillate; petals greenish yellow, ca. 2.7 × 1.2 mm, lanceolate, slightly fleshy, with an inflexed but inconspicuous apiculum 0.3–0.35 mm long, petals glabrous but margin long-papillate; antesepalous stamens 1.45–1.5 mm long, filaments strap-shaped, the anthers ca. 1 mm long and oblong, antepetalous stamens 1.25–1.3 mm, the anthers ca. 0.85–0.9 mm long and slightly ovate; disk 0.2–0.35 × 0.2 mm thick; pistillode 0.65–0.75 × 0.35–0.7 mm overall, ovary ovoid, the style 0.2 mm high with 4-lobulate apex; *pistillate flowers* unknown. Fruiting pedicel apparently variable in length, 1.5–5.5 × 2.5–4 mm, terete, *fruit* (Fig. 1G) brown or coffee-colored (reported as blackish green in *Cerón 3464*), 3.2–4.5 × 2.6–3.5 cm (to 3.8+ cm broad when more than one pyrene develops), broadly ovoid, only slightly oblique, the apex rounded, the base substipitate, obtuse to truncate above the stipe, the surface lenticellate and sometimes provided with scattered bristles and glands; pseudaril white, pulpy, covering all of pyrene, the pyrene (Fig. 1H) 2.4–3.1 × 1.7–2.3 cm, bony, in dorsiventral view the pyrene broadly ovate with acute to sharply acuminate apex, in lateral view the posterior side semi-ovate, the anterior side semi-obovate but deeply cleft at site of the funicular scar, which is located 66%–80% the distance to the pyrene apex, the funicular scar small, narrowly inverted-crescent shaped; pyrene surface glabrous; *seed* with testa irregularly thickened and cotyledons lobed and contortuplicate; *germination* and *seedlings* unknown.

Distribution and ecology. *Protium aidanianum* shows a western Amazonian distribution, in Ecuador and Peru. Unlike most *Protium*, the new species tends to occur in waterlogged soils, such as in periodically inundated areas (*SEF 10367*) and river island forests (*Berlin 3538a*), on soils reported as lateritic (*Gentry & Díaz 28254*) or red clay dystropept soils (*Zak 3831*) and at elevations between 180 and 400 m. It is known to flower in August and to fruit between August and January.

Common names and uses. Shakáp (Huambisa, *Berlin 3538a*; *Huashikat 185, 973, 1038*); tofakekopa (Kofán, *Pinkley 478*); chipa (Huambisa, *Tunqui 251*); patu muyu (Quichua, *Grijalva & Gudiño 2*); shirquillo (Quichua, *Revelo 94*). The Huambisa use the fruits to make necklaces (*Huashikat 1038*) and the resin to paint large earthen jars (*Tunqui 251*), while among the Kofán the resin has been applied to the ankles and touched with charcoal to make a black ring (Kofán, *Pinkley 478*), and the lowland Quichua use the resin to make candles (*Revelo 94*).

Etymology. It gives me great pleasure to name this species for my son Aidan, who helped me with the measurements, and who commented that it is quite remarkable; the same goes for him.

The new species most closely resembles another western Amazonian species, *P. nodulosum* Swart, because they both show long lateral petiolules, large coriaceous leaflets that are sometimes oblong and sometimes glossy adaxially, and large, brownish, substipitate, lenticellate fruits. *Protium aidanianum* differs by its leaves 5- or 6-jugate (vs. 2- to 4-jugate), lateral leaflet base truncate to slightly cordate (vs. usually acute), higher-order venation impressed or rarely flat adaxially, inflorescences shorter than the petioles, bracts on primary inflorescence axes (1)1.3–2 (vs. 0.6–0.9) mm long, flowering pedicel shorter (0.7–1.8 vs. ca. 1.5–6 mm), flowers 4-merous (not 5-merous), calyx more deeply cupular with lobes either obsolete or short and broad (0–0.4 vs. ca. 0.4–0.6 mm long), petals glabrous and not persistent in fruit (vs. pubescent, and often persistent and reflexed in young fruits), pistillode glabrous, fruit larger (3.2–4.5 × 2.6–3.5 vs. ca. 4 × 2.4 cm) and with rounded (vs. acuminate) apex, and funicular scar on the pyrene located 66%–80% the distance to the pyrene apex (not subapical).

Protium aidanianum also resembles the southwestern Amazonian species *P. glabrescens* Swart because of their robust branchlets, petiole often turning black and exfoliating, leaflets coriaceous and often oblong, secondary veins impressed adaxially (only sometimes in *P. glabrescens*), adaxial surface sometimes glossy, and inflorescence shorter

than the petiole of the subtending leaf. The new species differs by its deeply (vs. shallowly) canaliculate petiole, higher-order venation impressed adaxially, pedicel shorter (ca. 0.7–1.5 vs. 1.5–2 mm), consistently 4-merous flowers (vs. 4- to 5-merous), deeply cupular calyx, petal margin long-papillate (not short-papillate), and the fruit brown or coffee-colored (vs. green, pink, or red-brown), much larger (3.2–4.5 × 2.6–3.5 cm with one pyrene, vs. ca. 1.8–2.1 × 1.1–2 cm), and less oblique.

Paratypes. ECUADOR. **Napo:** P. N. Yasuní, near Amo Sur Heliport, 00°52′S, 76°05′W, 16–19 Jan. 1988 (fr), *Cerón 3464* (NY); La Joya de los Sachas, Pompeya, S side of Río Napo, Río Jivino, Maxus Camp, km 5–7 Maxus Road, 00°25′S, 76°37′W, 23–29 Nov. 1992 (fr), *Grijalva et al. 284* (NY); Canton Francisco de Orellana, Vía de los Zorros, Pozo Jaguar I, 00°44′S, 77°05′W, 23 Oct. 1988 (fr), *Palacios 3205* (NY); Dureno, on Río Aguarico, 4 Oct. 1966 (st), *Pinkley 478* (NY); Tena, Est. Biol. Jatun Sacha, 01°04′S, 77°36′W, 24 Nov. 1994 (fr), *Revelo 94* (NY); P. N. Yasuní, Río Añangu near confluence w/Río Napo, 0°312′S, 76°24′W, 30 June–9 July 1982 (st), *SEF 10367* (NY). **Pastaza:** Carretera de Petro-Canadá, Vía Auca, 115 km S of Coca, 4 km S of Río Tugüino, 01°15′S, 76°55′W, 22–28 Feb. 1989 (st), *Zak 3831* (NY). **Sucumbios:** Lago Agrio Canton, Res. Cuyabeno, Tarapoa-Tipischca, Cruce del Río Cuyabeno, 00°01′S, 76°15′W, 14 Nov. 1991 (fr), *Palacios et al. 8957* (NY). PERU. **Amazonas:** 1 km S of La Poza, Santiago River, 9 Aug. 1979 (fr), *Berlin 3538a* (MO, NY); 1 km from Poza, E margin of Río Santiago, 24 Aug. 1979 (fr), *Huashikat 185* (MO, NY); Prov. Condorcanqui, 1 km beh. Caterpiza, E of Quebrada Caterpiza, Río Santiago, 17 Oct. 1979 (fr), *Huashikat 973* (MO), 24 Oct. 1979 (fr), *Huashikat 1038* (MO); Río Santiago, Quebrada Caterpiza, 2–3 km beh. Caterpiza, 7 Dec. 1979 (fr), *Tunqui 251* (MO, NY). **Huánuco:** Pachitea, Codo de Pozuzo, trail W of settlement to lower mountain slopes, 9°40′S, 75°28′W, 17 Oct. 1982 (fr), *Foster 9239* (NY). **Loreto:** Prov. Alto Amazonas, Andoas, Río Pastaza, near Ecuador border, 17 Nov. 1979 (fr), *Gentry & Díaz 28254* (NY).

Acknowledgments. Once again, I thank Bobbi Angell for a revealing and attractive illustration, also James Solomon of MO for his timely help with tracking down duplicates of the type collection.

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A New Species of *Ruyschia* (Marcgraviaceae) from the South American Andes

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ABSTRACT. *Ruyschia andina*, a new species found on the eastern slopes of the Andes in Ecuador, Peru, and Bolivia at altitudes of around 2000 m, is described and illustrated. The species is distinguished from the other species of the genus by the leaves with two conspicuous rows of numerous hypophyllous glands and the 3(or 4)-loculed ovary. The relationship between *Ruyschia* and *Souroubea* is discussed, and a generic key is given.

Key words: Andes, Bolivia, Ecuador, Marcgraviaceae, Peru, *Ruyschia*, South America.

The genera *Ruyschia* Jacquin and *Souroubea* Aublet are commonly considered to be closely related (de Roon, 1975). Swartz (1788) united the two genera, then still monotypic, under *Ruyschia*. This was followed by Martius (1832) and Triana and Planchon (1862), who described a number of new species of *Ruyschia* that currently are placed in *Souroubea*. Delpino (1869), the first monographer of the Marcgraviaceae, separated the two genera again. This was adopted by all subsequent students of the Marcgraviaceae, namely Wittmack (1878), Szyszylowicz (1893), Gilg and Werdermann (1925), de Roon (1975), Bedell (1985), and Dressler (2004). The two most important characters to distinguish *Ruyschia* and *Souroubea* are in the nectariferous bract and in the pistil. *Ruyschia* has small, foliaceous, flat or gibbous to slightly concave nectariferous bracts and a (sub)globular, mostly 2-loculed ovary with a minute or distinct style and a small stigma, while *Souroubea* has hollow, cup- or spur-shaped and auriculate nectariferous bracts and an often angular, (3- to)5-loculed ovary with a usually large, sessile, often radiate stigma. The placement of a given species in either one or the other genus has sometimes been arbitrary. *Ruyschia pilophora* Triana & Planchon was placed by Delpino (1869) in *Souroubea* on account of the small, slightly hollow, somewhat *Souroubea*-like nectariferous bracts, but was placed again in *Ruyschia* by de Roon (1975) on account of the 2-loculed ovary. On the contrary, *Ruyschia platyadenia* Gilg, with small, flat, foliaceous, nectariferous bracts, was placed in *Souroubea* because of the 5-loculed ovary (de Roon, 1975). The separation of *Ruyschia* and *Souroubea* remains disputed and possibly needs reconsideration.

The current generic subdivision of the Marcgraviaceae–Noranteoideae was based on morphological features (Bedell, 1985; see also Dressler, 2004) and is not supported by the molecular data presently available. Ward and Price (2002) presented molecular data that suggest a closer relationship between a species of *Ruyschia* and a species of *Schwartzia* than to investigated species of *Souroubea*. In a recent study of wood anatomy and pollen morphology of the Marcgraviaceae, Van Evelghem (2003) found no support for an amalgamation of *Ruyschia* and *Souroubea*. However, both studies (Van Evelghem and Ward & Price) included only one species of *Ruyschia* and three of *Souroubea*, respectively. Decisions regarding possible taxonomic changes in the Marcgraviaceae have to wait until sufficient molecular and other data are available.

Up to now, seven species of *Ruyschia* have been accepted, all from mountainous areas: *R. clusiifolia* Jacquin is confined to the Lesser Antilles (St. Kitts, Guadeloupe, Martinique, and Dominica); *R. enervia* Lundell ranges from southern Mexico to Belize, Guatemala, Honduras, and Costa Rica; *R. phylladenia* Sandwith is rather common in Costa Rica and Panama; *R. valerii* Standley, closely related to *R. phylladenia*, and differing in leaf shape only, is a rare endemic in Costa Rica; *R. tremadena* (Ernst) Lundell is common and widespread in Panama (Darién), Colombia, and Venezuela; *R. pilophora* Triana & Planchon is endemic to Colombia; and *R. pavonii* G. Don is known from Colombia and Peru.

During identification work another hitherto undescribed species was found. This new species is distinguished from the other species of the genus by its relatively large leaves with a conspicuous row of numerous hypophyllous glands running the length of the leaf blade on either side of the midvein, approximately halfway between the midvein and the leaf margins, a 15–30 cm long raceme with 60 to 130 flowers, and flowers with a 3(or 4)-loculed

ovary. The last character especially is remarkable, as all other species of the genus have a 2-loculed ovary.

Ruyschia andina de Roon, sp. nov. TYPE: Ecuador. Prov. Zamora-Chinchipe: Road Loja–Zamora, km 28.3, secondary scrub above storm drain, 3°57'S, 79°3'W, 2000 m, 27 Dec. 1997 (fl), *G. P. Lewis, P. Lozano & C. C. Berg 3733* (holotype, U; isotypes, AAU not seen, E not seen, K not seen, LOJA not seen, MO not seen, QCA not seen, QCNA not seen). Figure 1.

Frutex scandens saepe hemiepiphyticus. Folia petiolis ad 10 mm longis; lamina coriacea, obovata, 8–15 cm longa, 3.5–7.5 cm lata, apice obtusa vel rotundata, basi acuta vel cuneata; glandulae hypophyllae numerosae, biseriatae. Racemi 15–30 cm longi, flores 60–130; nectaria leviter cymbiformia, ovarium 3(–4) loculare.

Shrub, hemiepiphytic shrub, or woody climber, stem 10 cm diam., strongly branched. Leaves petiolate, petioles 5–10 mm long, 2–3 mm diam., flattened to canaliculate above; blades obovate, 8–15 cm long, 3.5–7.5 cm wide, apex obtuse to rounded and mucronate or minutely retuse after the mucro has fallen, base acute to cuneate, margin slightly revolute, coriaceous, midrib slightly prominent at base to slightly canaliculate above, prominent beneath, secondary veins obscure to slightly impressed above, obscure to subprominent beneath; hypophyllous glands poriform, usually in a conspicuous row of 10 to 25 ca. halfway between the margin and midrib on either side. Inflorescence a raceme, 15–30 cm long, with 60 to 130 flowers. Flowers pedicellate, pedicels 5–8 mm long; nectariferous bracts slightly cymbiform, 3–4 mm long, inserted just below the flowers; bracteoles directly subtending the calyx, sepaloid, oval, 1.5–2 mm long, ca. 2 mm wide, persistent; sepals suborbicular, ca. 2 mm long, 2.5–3 mm wide, persistent; petals oblong, 6–7 mm long, 2–3 mm wide; stamens 5, filaments flattened, 1–1.5 mm long, ca 0.5 mm wide, abruptly narrowed toward the anthers; anthers 2–3 mm long, 1 mm wide; ovary 1–1.25 mm long, 3(or 4)-loculed, style conical, 0.75–1 mm long. Fruit depressed globose, apiculate by the persisting style and stigma, ca. 5 mm diam., fleshy, green tinged red.

Phenology. Flowering specimens are collected in December, January, March, and August, and fruiting specimens in November, December, January, March, April, and May.

Distribution. *Ruyschia andina* is found in primary and secondary tropical montane rain forests and cloud forests at altitudes of 1800–2300 m on the eastern Andean slopes in Ecuador, Peru, and Bolivia.

Besides the new species, three other species are known from South America: *Ruyschia tremadena* in Venezuela, Colombia, and Panama (Darién), characterized by gibbous to semiglobose nectaries inserted at the base of the calyx and by 3 stamens; *Ruyschia pilophora* in Colombia, characterized by small, excavated, hat-shaped nectaries inserted at the base of the calyx; and *Ruyschia pavonii* in Colombia and Peru, characterized by (sub)globose nectaries inserted at about the middle of the pedicel.

KEY TO THE NEOTROPICAL SPECIES OF *RUYSCHIA*

1a. Stamens 3.
  2a. Leaf blade 3–5 cm wide; nectaries gibbous to semiglobose . . . . . *R. tremadena*
  2b. Leaf blade 1.5–3 cm wide; nectaries foliaceous, flattened or slightly gibbous.
    3a. Leaf blade acuminate; pedicels 3–5 mm long . . . . . *R. valerii*
    3b. Leaf blade obtuse to subacuminate; pedicels 5–9 mm long . . . *R. phylladenia*
1b. Stamens 5.
  4a. Nectaries inserted near the middle of the pedicel . . . . . *R. pavonii*
  4b. Nectaries inserted at the base of the flowers.
    5a. Nectaries hollowed out, hat-shaped . . . . . *R. pilophora*
    5b. Nectaries solid, gibbous to semiglobose.
      6a. Hypophyllous glands numerous in a distinct row of 10 to 25 ca. halfway between the margin and midvein on either side; ovary 3-celled . . . . . *R. andina*
      6b. Hypophyllous glands few, scattered or in a row of 2 to 7 between the margin and midvein on either side, sometimes absent; ovary 2-celled.
        7a. Hypophyllous glands small or minute; nectaries cymbiform, concave beneath; pedicels slender, 4–10 mm long, ca. 1 mm thick . . . . . *R. clusiifolia*
        7b. Hypophyllous glands large, with a light-colored circumvallation, nectaries gibbous to semiglobose, flattened beneath; pedicels stout, 3–5 mm long, 1–1.5 mm thick . . . . *R. enervia*

Paratypes. BOLIVIA. **La Paz:** Prov. Sud Yungas, Sirubaya near Yanacachi, *O. Buchtien 520* (US, W); 7 km de Huancané en carr. a San Isidro, *D. N. Smith, V. García, L. Dorr & L. Barnett 13915* (B, LPB not seen, MO not seen, U). ECUADOR. **Prov. Zamora-Chinchipe:** Road Loja–Zamora, *G. P. Lewis, J. Luteyn, R. Fuller & E. M. Guerrón 3249* (AAU not seen, B, K not seen, LOJA not seen, MO not seen, QCA not seen, QCNE not seen); area of Estación Científica San Francisco, ca. 30 km away from Loja on hwy. tow. Zamora, *S. Matezki 227* (FR, MO not seen), *S. Matezki 453* (FR, UBT not seen); E Andean

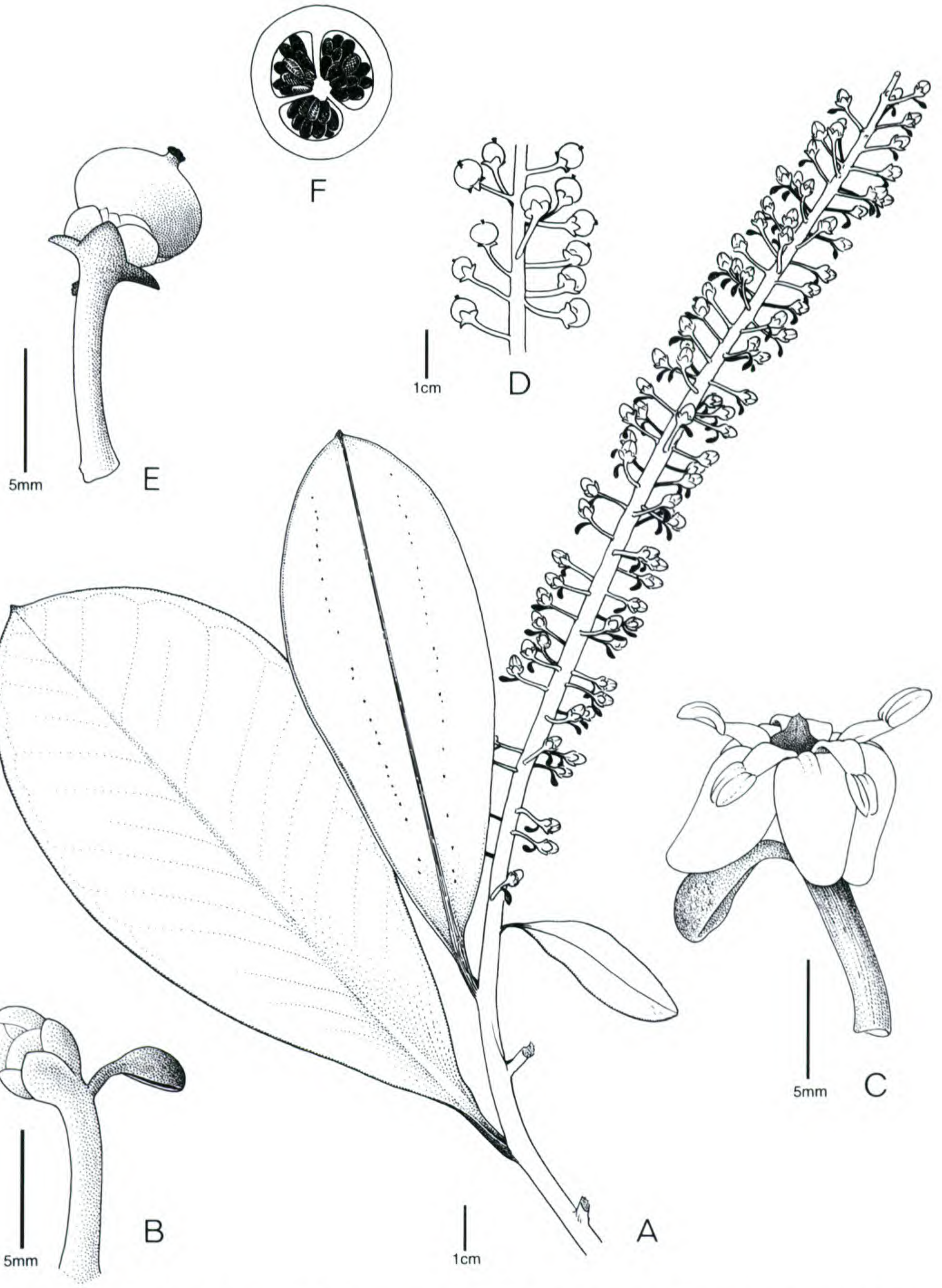

Figure 1. *Ruyschia andina* de Roon. —A. Flowering branch. —B. Flower bud with nectariferous bract. —C. Flower. —D. Infructescence. —E. Fruit. —F. Fruit, transverse section. A, B from *Lewis et al. 3733* (U) ; C from *Matezki 453* (FR); D from *Lewis et al. 3249* (B); F from *Matezki 227* (FR).

slopes, Quebrada El Milagro watershed, *D. Neill & QCNE botany interns 12612* (FR, MO not seen, QCNE not seen); El Pangui, Cordillera del Cóndor, dest. militar Cóndor Mirador en la Frontera Ecuador–Peru, *G. Pabon, J. Caranqui & Grupo Post-Grado MO-QCNE 333* (MO not seen, U); sandstone escarpment above & W of Tikimints, valley of Río Coangas, *P. E. Berry & D. Neill 7635* (FR, MO not seen, QCNE not seen). **Prov. Morona Santiago:** Cantón San Miguel de los Cuyes, main trail betw. the villages of San Miguel de los Cuyes & Ganazhuma (via Río San Mi-

guel de los Cuyes), *J. L. Clark & C. Morocho 5859* (U, US not seen). PERU. **Cajamarca:** Prov. San Ignacio, San José de Lourdes, Camino al Cerro Picorana, *J. Campos, L. Campos & L. Zurita 5514* (FR, MO not seen).

Acknowledgments. I thank the curator of the Senckenberg herbarium (FR) for sending me a comprehensive collection of *Ruyschia* and *Souroubea* for identification, among which the type collection and many paratypes of the new species were found. I am much indebted to Stefan Dressler and to Gwilym Lewis for valuable suggestions, which improved the manuscript. I thank Lubbert Westra for his assistance with the Latin diagnosis and the first draft and Hendrik Rypkema for the illustration.

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A New Species of *Crotalaria* (Leguminosae, Papilionoideae) from Southeastern Brazil

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Abstract. *Crotalaria miottoae*, a new species of Leguminosae from southeastern Brazil, is described and illustrated. The new species is close to *Crotalaria vitellina* Ker Gawler, but differs in having larger wing petals, fruits, and seeds, in having terminal inflorescences, rarely leaf-opposed, and the leaflets usually rhombic or narrowly elliptic.

Resumo. *Crotalaria miottoae*, uma nova espécie de Leguminosae no sudeste do Brasil é descrita e ilustrada. Esta espécie é relacionada à *Crotalaria vitellina* Ker Gawler, diferindo desta por possuir alas, frutos e sementes maiores, inflorescências terminais, raramente opositifólias e folíolos rômbicos ou estreitamente elípticos.

Key words: Brazil, *Crotalaria*, Leguminosae, Papilionoideae.

Crotalaria L. is a large legume genus of ca. 600 species distributed in the tropical and subtropical regions of the world mostly in Africa and Asia (Polhill, 1981, 1982), while 42 species have been recorded for Brazil. During a taxonomic revision of the Brazilian species of *Crotalaria*, an undescribed species came to our attention and is described herein as new.

Crotalaria miottoae A. S. Flores & A. M. G. Azevedo, sp. nov. TYPE: Brazil. Minas Gerais: Camanducaia, Monte Verde, estrada para Pedra Partida, 2 Jul. 2002, *A. S. Flores 1036 & R. Schütz Rodrigues* (holotype, UEC; isotypes, F, HBG, MO, SPF). Figure 1.

Haec species *C. vitellinae* ramis puberulis et bracteis persistentibus similis sed alis longioribus, leguminibus et seminibus majoribus, foliolis saepe rhombicis vel anguste ellipticis et inflorescentiis terminalibus raro oppositifoliis differt.

Erect shrub or subshrub, 1.5–2 m high; branches puberulous to finely pubescent with short, yellow or white trichomes. Internodal stem wings absent. Leaves digitately 3- to 4- or 5-foliolate, petiole 2.5–5.4 cm long, puberulous; leaflets usually rhombic or narrowly elliptic, the apex acuminate or acute, base cuneate, 3–5.8(7.4) × 1–1.5(2.5) cm, discolorous, puberulous above, glabrous beneath; stipule 1–1.5 mm long, linear, usually persistent. Inflorescence a terminal or rarely leaf-opposed raceme, 7–15 cm long, 8- to 25(35)-flowered; peduncle 1.5–2.5 cm long; pedicel 7–9 mm long; bract 2–4 mm long, filiform, persistent; bracteole 1–2 mm long, filiform, inserted at the middle of the pedicel, persistent. Calyx 7–10 mm long, shorter than the corolla, the tube campanulate; lobes 5, twice as long as the tube, triangular to lanceolate, finely pubescent or glabrescent; corolla yellow; standard petal 1.2–1.8 × 1.1–1.7 cm, suborbicular; wing petal 1.3–1.8 cm long, obovate to oblong; keel 1.1–1.6 cm long, almost as long as the wing petals, dorsal margin rounded, the non-twisted beak short, the margins ciliate or glabrous. Stamens dimorphic with anthers alternately 5 long, basifixed and 5 smaller, dorsifixed; ovary 4–5 mm long, oblong, puberulous along the margin and glabrous at the center, stipitate; style curved, stigma pubescent. Legume 3.2–4.3 × 1.1–1.4 cm, broadly oblong or obovoid, puberulous or glabrous, stipitate, black at maturity, ca. 20-seeded; seeds 6–7 × 5–6 mm, oblique-cordiform, seed coat black, opaque.

Distribution and ecology. Southeastern Brazil, in Rio de Janeiro, Espírito Santo, and Minas Gerais states. *Crotalaria miottoae* grows in campo rupestre, along the margins of wet forest and inside montane forests at elevations of 1000–1900 m.

Phenology. Collected in flower and in fruit during most of the year.

The species is named in honor of Sílvia T. Sfoggia Miotto, Brazilian legume specialist, who has stimulated this work since the beginning.

According to the sectional classification proposed by Bisby and Polhill (1973), *Crotalaria miottoae* should be assigned to section *Chrysocalycinae* (Bentham) Baker f. due to its calyx subequally 5-lobed and 0.7 as long as the keel. It is closely related to *Crotalaria vitellina* Ker Gawler, both spe-

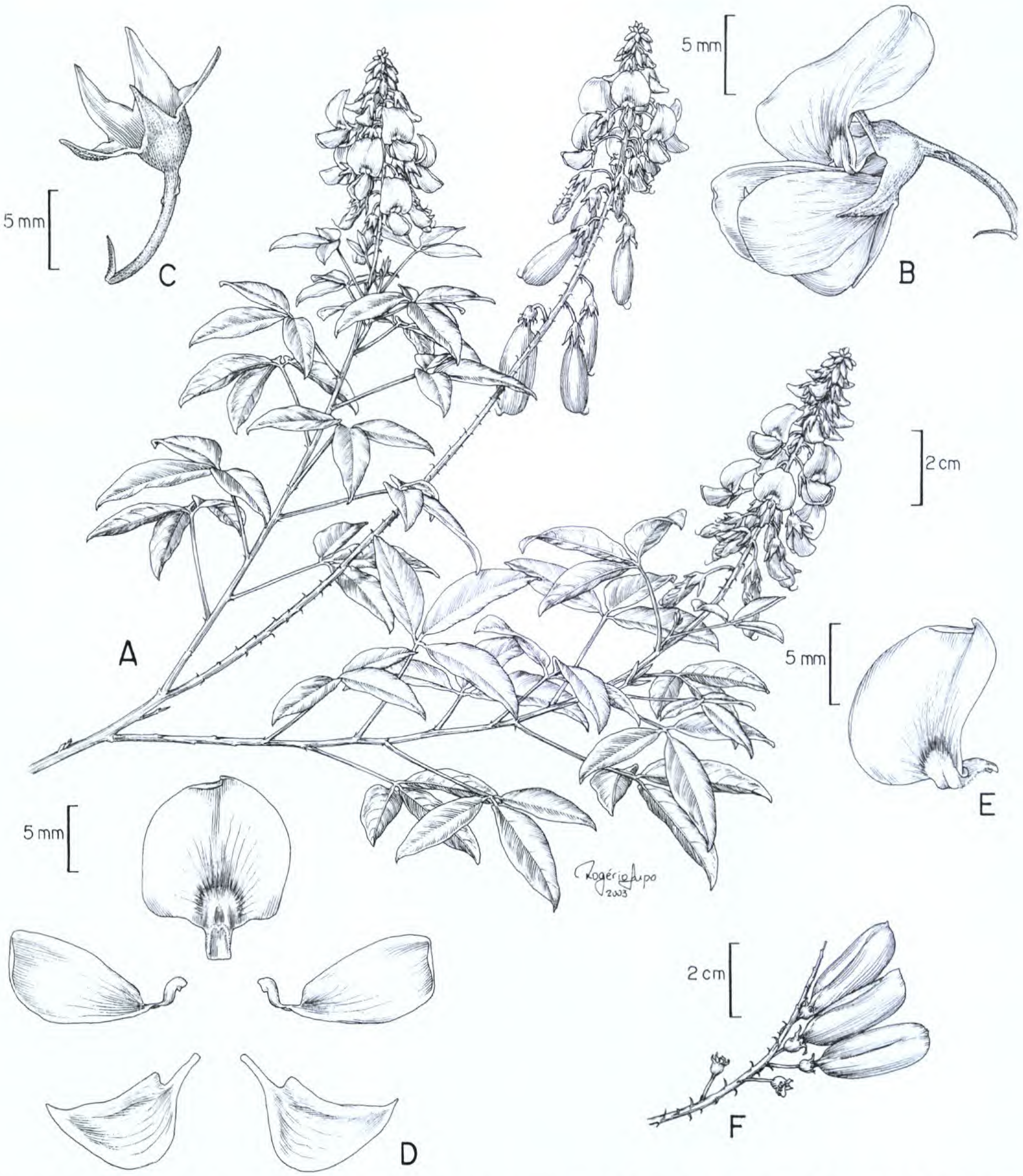

Figure 1. *Crotalaria miottoae* A. S. Flores & A. M. G. Azevedo. —A. Fertile branches. —B. Flower. —C. Calyx. —D. Details of corolla: standard petal, wings, and keel. —E. Alternative view of standard petal. —F. Part of infructescence with mature fruits. (Drawn from the holotype.)

cies having puberulous to finely pubescent branches and persistent bracts. However, *C. vitellina* has smaller wing petals (0.9–1.3 cm long), legumes 1.6–3.2 × 0.6–0.9 cm, subcylindrical or oblong-ellipsoid, brown at maturity, seeds 4 × 4 mm, brown and elliptic, oblong, or obovate leaflets. *Crotalaria miottoae* also differs in having terminal inflorescences, which are absent in *C. vitellina*. *Crotalaria laeta* Martius ex Bentham, proposed as a variety of *C. vitellina* by Windler and Skinner (1982), is considered a distinct species by Flores (unpublished thesis). *Crotalaria laeta* differs from both species in having the wing petal smaller than the keel. In addition, it differs from *C. miottoae* in having a smaller wing petal (7–8 mm long), keel (9–11 mm long), fruits (1.2–1.8 × 0.4–0.7 cm), and seeds (3 × 3 mm). *Crotalaria miottoae* resembles vegetatively *C. micans* Link and has similar fruits,

but *C. micans* has a keel that is lanate toward the upper margin with a slightly incurved beak and caducous bracts and bracteoles.

Some specimens of *Crotalaria miottoae* that occur in Rio de Janeiro and Espírito Santo states have leaves digitately 3-, 4- or 5-foliolate and more dense pubescence in branches, ovaries, and legumes.

Paratypes. BRAZIL. **Espírito Santo:** Domingos Martins, Pedra Azul, BR 262 km 86, *A. S. Flores 1074, R. Schütz Rodrigues & V. F. Mansano* (UEC). **Minas Gerais:** Camanducaia, Monte Verde, *A. S. Flores 619, R. Schütz Rodrigues, L. D. Meireles & R. Belinello* (UEC); Serra do Cipó, km 135, ca. 150 km N of Belo Horizonte, *H. S. Irwin, H. Maxwell & D. C. Wasshausen 20534* (F, UB). **Rio de Janeiro:** Nova Friburgo, Pico Nova Caledônia, *H. C. de Lima 2527, P. E. Berry, J. F. Baumgratz & J. C. Gomes* (F, INPA, RB); Serra dos Órgãos, *D. R. Hunt 6474* (SP, UB); Teresópolis, Serra dos Órgãos, ca. 5 km SW of city of Teresópolis, *G. Eiten & L. T. Eiten 7174* (SP, UB).

Acknowledgments. We are grateful to Rodrigo Schütz Rodrigues and Leonardo Dias Meireles for kind help collecting *Crotalaria* species, Rodrigo Schütz Rodrigues for assistance with the Latin diagnosis, Kayna Agostini for improving the English, and Rogério Lupo for preparing the illustration. We appreciate the helpful review offered by G. P. Lewis. This work was supported by the Fundação de Amparo à Pesquisa do Estado de São Paulo (FAPESP) proc. 00/11674–2.

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A New Species of *Styrax* (Styracaceae) from Southern Mexico

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ABSTRACT. *Styrax uxpanapensis*, a new species of *Styrax* series *Valvatae* (Styracaceae) from the Uxpanapa-Chimalapa region in the states of Oaxaca and Veracruz, Mexico, is described and illustrated. The stamen morphology of this lowland humid tropical forest species appears to ally it with two Andean cloud forest species. A section of a key to Mexican and Mesoamerican species of *Styrax*, as modified to incorporate *S. uxpanapensis*, is included.

Key words: Mexico, Oaxaca, Styracaceae, *Styrax*, Veracruz.

Several specimens examined for the revision of *Styrax* L. (Styracaceae) for western Texas, Mexico, and Central America (Fritsch, 1997) were, for various reasons, of uncertain placement. Among these was a lowland collection in fruit from Municipio de Hidalgotitlán, Uxpanapa region of Veracruz, Mexico (2 Dec. 1981, *T. Wendt 3576*). I tentatively identified this specimen as *S. panamensis* Standley (Fritsch, 1997). Because *S. panamensis* is known only from a single collection in flower bud (Panama, 1911, *H. Pittier 4242*), however, the taxonomic status of the Veracruz collection remained unclear.

I have recently examined more material of *Styrax* from the Uxpanapa region of Veracruz and adjacent Chimalapa region in eastern Oaxaca and have identified two more collections with clear similarity to *Wendt 3576*. The combination of floral and fruit features present in these three collections clearly distinguishes them from *S. panamensis* and all other described *Styrax* species, such that the description of a new species is warranted. Here I describe this new species and incorporate it into a section of a previously published (Fritsch, 1997) key to Mexican and Mesoamerican species of *Styrax* to aid identification.

Styrax uxpanapensis P. W. Fritsch, sp. nov. TYPE: Mexico. Veracruz: Uxpanapa, Esfuerzo Nuevo, al E, 17°10′15″N, 94°21′18″W, 225 m, 3 May 1996, *J. Rivera H. & S. Escobedo 78* (holotype, MEXU; isotypes, CAS, TEX). Figure 1.

Haec species *S. argenteo* similis, sed calyce 2–2.5 mm longo, lobis corollae 7–9 × 1.2—2.0 mm, auriculis filamenti conspicuis, antheris 4–5 mm longis differt.

Evergreen tree to 23 m tall; young twigs grayish brown-stellate-tomentose. Petiole 9–17 mm long; lamina 13–21.5 × 5.4–8.2 cm, 2.1–2.9 times as long as wide, chartaceous, elliptic, secondary veins 7 to 9 on each side of midvein; apex acute to short-acuminate; base cuneate to rounded, adaxially glabrous except on midrib and secondary veins, these slightly impressed; abaxially greenish gray to the naked eye, with a dense, thin base tomentum of minute greenish white stellate trichomes, and larger scattered stiff tawny stellate trichomes (especially prevalent on the veins) with arms to 0.3 mm long, the base tomentum absent from the primary through tertiary veins, the tawny to light orange surface of the primary through tertiary veins easily visible through the pubescence, the tertiary veins slightly raised; margin entire. Inflorescences axillary, terminal, or produced above leaf scars proximally along the branch, racemose or paniculate, 1 to 3 per node, 3–4 cm long, 5- to 23-flowered, greenish gray-stellate-tomentose with scattered orange to ferrugineous stellate trichomes, the lax to somewhat stiff trichomes to 0.3 mm long; lower pedicels 3–4 mm long. Flowers hermaphroditic, 10–12 mm long; calyx 2–2.5 × 3–4 mm, shallowly cupuliform, densely grayish green-stellate-tomentose, trichomes at mid-calyx with arms to 0.2 mm long, margin concave to truncate between the minute teeth; corolla 8–10 mm long, white; tube 0.8–1.2 mm long, extending up to the calyx margin; lobes 5, 7–9 × 1.2–2.0 mm, spreading, thick; stamens 10; free portion of stamen tube 0.5 mm long; distinct portion of filaments 0.8–1 mm long, ventrally with prominent auricles bearing a dense mass of tawny-yellow stellate trichomes with arms to 0.8 mm long, trichomes nearest the proximal end of the auricle with arms predominantly pointing upward, also often stellate-pubescent in sinuses of filaments, dorsally glabrous; anthers 4–5 mm long, the glabrous connectives slightly exceeding the linear, apically tapered, short stellate-pubescent thecae; ovary densely golden orange-stellate-tomentose; style filiform, glabrous; ovules many. Drupe 1.6–2.3 × 0.9–1.4 mm,

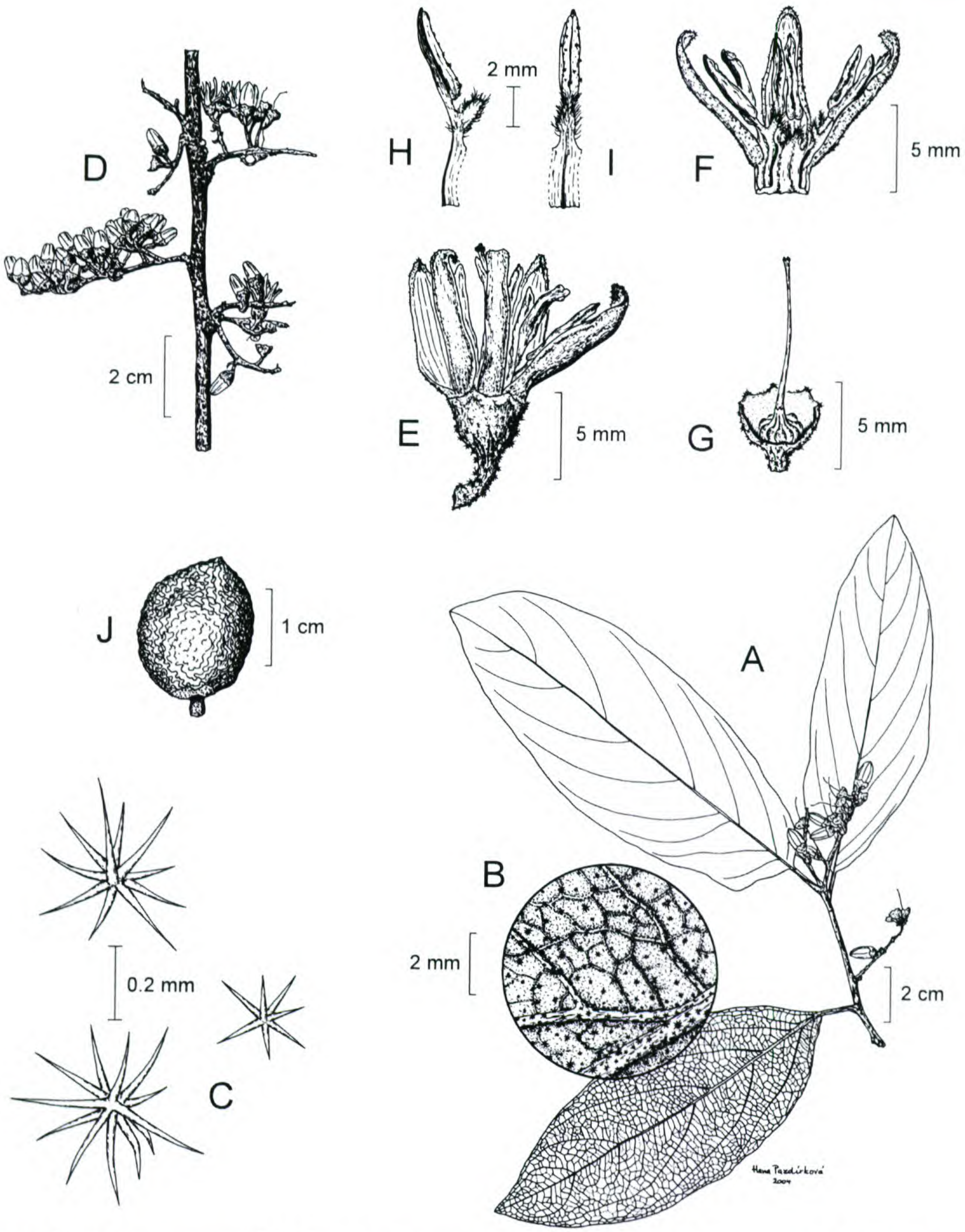

Figure 1. *Styrax uxpanapensis* P. W. Fritsch, new species. —A. Branch with distal inflorescences. —B. Leaf surface, abaxial view. —C. Stiff stellate trichomes from the abaxial side of the leaf. —D. Branch with proximal inflorescences. —E. Flower. —F. Flower, median long-section. —G. Calyx, long-section, and gynoecium. —H. Stamen, lateral view. —I. Stamen, ventral view. —J. Fruit. A–I based on *Rivera & Escobedo 78* (CAS isotype); J based on *Wendt et al. 3576* (MEXU).

grayish green, ellipsoid, apex rounded; wall irregularly and very coarsely rugose on herbarium specimens; fruiting calyx shallowly cleft-cupuliform to discoid, 5–7 × 1–2 mm, 0.06–0.12 times the length of the drupe proper.

Etymology. The specific epithet refers to the Uxpanapa region in southeastern Veracruz and eastern Oaxaca, from which the type collection of the species was made.

Habitat, distribution, and phenology. *Styrax uxpanapensis* is endemic to the Uxpanapa-Chimalapa region in extreme southeastern Veracruz and eastern Oaxaca, Mexico, where it has been found in secondary vegetation along arroyos and in chaparrera, a type of secondary rain forest (T. Wendt, pers. comm.; information from specimen labels) at 225–250 m. It was collected in flower in May, and in fruit in September.

The Uxpanapa-Chimalapa region comprises part of an area of the Mexican Atlantic slope rain forest that is rich in endemic species (Wendt, 1987, 1993). The geographic distribution of the available collections of *Styrax uxpanapensis* suggests that it is endemic to this region. Species of *Styrax* (e.g., *S. glabrescens* Bentham, *S. warscewiczii* Perkins) have been collected from surrounding areas in Mexico and Central America, but *S. uxpanapensis* has not been among these.

Styrax uxpanapensis belongs to *Styrax* sect. *Valvatae* Gürke series *Valvatae* Perkins, a clade of about 78 species of *Styrax* endemic to the Neotropics (Fritsch, 1999). Species of this series are easily distinguished from other members of *Styrax* by the combination of persistent leaves and a fleshy to juicy mesocarp (Fritsch, 1999). Within this group, the species is part of a clade that possesses robust trichomes on the stamen filaments (generally 0.8–2 mm vs. up to 0.7 mm long) and anther connectives that are prolonged beyond the anther sacs (vs. not or only slightly exceeding the anther sacs; see key below and Fritsch, 1999).

Other than *Styrax peruvianus* Zahlbruckner, *S. uxpanapensis* is the only species of *Styrax* in Mexico and Mesoamerica that possesses prominent stamen filament auricles. Other species of *Styrax* with this feature are endemic to South America, mostly in Andean cloud forests. *Styrax peruvianus* is not likely to be the closest relative of *S. uxpanapensis* because it has an indument of peltate scales instead of stellate trichomes and linear-triangular (vs. linear) anther sacs. Thus, unless prominent auricles have arisen independently in *S. uxpanapensis*, the phylogenetic affinity of this species appears to be with the Andean cloud forest species *S. subargenteus* Sleumer or *S. tomentosus* Bonpland, or both. *Styrax uxpanapensis* is similar to these species in its stellate trichomes and linear anther sacs, but is distinguishable from them by its larger leaves (13–21.5 cm vs. 5.5–12 cm long) and smaller flowers (10–12 mm vs. 13–20 mm long; Perkins, 1907; Sleumer, 1936; P. Fritsch, pers. obs.). Furthermore, *S. uxpanapensis* is a lowland species, whereas *S. subargenteus* and *S. tomentosus* are montane. Floristic affinities between the Uxpanapa region and areas of South America have been noted by Wendt (1993).

Paratypes. MEXICO. **Oaxaca:** Juchitán, Santa María Chimalapa, 3 km W of San Antonio Nuevo Paraíso, Plan de la *Ceiba*, 21 Sep. 1997, *E. Torres B., J. Rivera H., T. Alvarez R. & D. Acuca V. 1347* (CAS, MEXU). **Veracruz:** Hidalgotitlán, hills SE of Poblado 6, 2 Dec. 1981, *T. Wendt, A Villalobos C. & I. Navarrete 3576* (CHAPA, MEXU[2]).

KEY TO MEXICAN AND MESOAMERICAN SPECIES OF *STYRAX* WITH ANTHER CONNECTIVES PROLONGED BEYOND THE ANTHER SACS

1a. Calyx vestiture of stellate hairs.
  2a. Calyx vestiture uniformly golden brown; lamina 1.5 times as long as wide . . . *S. panamensis*
  2b. Calyx vestiture predominantly or completely grayish green, occasionally with additional scattered yellow or orange-brown trichomes; lamina 2.1–3.8(–5.2) times as long as wide.
    3a. Calyx 2–2.5 mm long; corolla lobes 7–9 × 1.2–2.0 mm; filament auricles conspicuous; anthers 4–5 mm long . . . . . *S. uxpanapensis*
    3b. Calyx 2.5–5 mm long; corolla lobes 8–14 × 1.7–4 mm; filament auricles inconspicuous; anthers 5–8 mm long.
      4a. Upward-pointing trichomes on the filament auricles with at least some arms 1–2 mm long; abaxial laminar surface and outer calyx grayish green-stellate-pubescent, without scattered orange-brown stellate trichomes; larger drupes 13–18 mm long (excluding beak, if present), ellipsoid or ovoid-ellipsoid; corolla lobes 1.7–2.3 mm wide, widely spreading or recurved . . . . . *S. argenteus* C. Presl
      4b. Upward-pointing trichomes on the filament auricles with arms to 1 mm long; abaxial laminar surface and outer calyx with scattered, orange-brown, stellate trichomes in addition to grayish green pubescence; larger drupes (15–)17–28 mm long, ovoid or obovoid; corolla lobes 2.5–4 mm wide, recurved or reflexed . . . . . *S. nicaraguensis* P. W. Fritsch
1b. Calyx vestiture of radiate, peltate, or lacerate-margined scales.
  5a. Calyx with vestiture of peltate or lacerate-

margined scales; scales at mid-calyx 0.27–0.44 mm diam . . . . . *S. peruvianus*

5b. Calyx with vestiture of radiate scales; scales at mid-calyx 0.05–0.33 mm diam.

6a. Abaxial laminar surface glabrous or nearly so; calyx 4–7 mm long, in fruit funnelform, 4–8 mm long; anthers 5–8 mm long; corolla lobes linear-deltoid . . . . . *S. glabratus* Schott

6b. Abaxial laminar surface densely pubescent; calyx 2.5–3 mm long, in fruit shallowly cupuliform, to 1.5 mm long; anthers to 4.5 mm long; corolla lobes linear . . . . . *S. steyermarkii* P. W. Fritsch

Acknowledgments. I thank Tom Wendt for bringing his collection of this species to my attention and for insight into the habitat of the species; Mario Sousa and the curators of MEXU for facilitating examination of MEXU *Styrax* material; Hana Pazdirkova for the illustration; and Arne Anderberg, Jon Ricketson, and one anonymous reviewer for helpful comments on the manuscript.

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A New Species of *Bourreria* (Ehretiaceae, Boraginales) from Costa Rica

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ABSTRACT. We describe *Bourreria grayumii* (Ehretiaceae) as new from Costa Rica, near the Nicaraguan border. It is illustrated, and a distribution map is provided. The new species may be closely related to *Bourreria huanita*, as both share schizocarpous fruits, an unusual and specialized character in *Bourreria*.

Key words: Boraginales, *Bourreria*, Costa Rica, Ehretiaceae.

Bourreria P. Browne comprises approximately 30 New World species and belongs to the Ehretiaceae of a more broadly circumscribed Boraginales (Boraginaceae s.l.), additionally including the subordinate taxa Boraginaceae s. str., Heliotropiaceae, Cordiaceae, and also Hydrophyllaceae and Lennoaceae (Thorne, 1983; Gottschling et al., 2001). In the course of examining specimens and preparing the taxonomic treatments of the borages for the *Manual de Plantas de Costa Rica* and for the *Flora Mesoamericana*, collections representing a previously undescribed taxon were discovered. Former authors assigned these collections to *Bourreria mollis* Standley (= *Bourreria oxyphylla* Standley), which is common in Mexico, Belize, and Guatemala (Nowicke, 1969; Gentry & Janos, 1974; Miller, 1988) and also occurs in Honduras, Panama, and Colombia. The present study shows the Nicaraguan and Costa Rican collections that have been treated as *B. mollis* (= *B. oxyphylla*) differ consistently in several morphological features and are best considered as the distinct new species below.

Bourreria grayumii Gottschling & J. S. Mill., sp. nov. TYPE: Costa Rica. Cantón de Upala, along Río Chimurria, vic. Colonia Puntarenas, ca. 11 km (by rd.) SE of Upala, 80–100 m, 10°49′N, 84°53′W, 17 Nov. 1988 (fl, fr), *M. H. Grayum, G. Herrera & R. Evans 9048* (holotype, MO 4265358; isotypes, CR, F 2117346, MEXU, MO 4265359). Figures 1, 2.

Arbor vel frutex usque ad 12(–20) m altus. Lamina glabra, elliptica, 1.5–10.9 cm longa, (0.4–)0.8–4.3 cm lata, apice acuminata, basi acuta; folia petiolo ca. 7 mm longo, glabro. Inflorescentia plerumque terminalis, thyrsoidea. Flos fragrans; calyce (4–)5–7 mm longo, intus tomentoso; corolla alba, infundibuliformi, (10–)12–17 mm longa, 5-loba, tubo 7–10 mm longo, lobulis ovatis, 3–6 mm longis; staminibus 5, filamentis glabris, ad tubum corollae adnatis; stylo simplici, (4–)6–8 mm longo. Fructus immaturus succulentus, ca. 10 mm diam., maturitate schizocarpus.

Trees or shrubs, to 12(–20) m tall; bark light brown, rarely gray; branches glabrous; lenticels absent. Leaves alternate, the blade 1.5–10.9 × (0.4–)0.8–4.3 cm, elliptic to obovate, occasionally asymmetric, the apex usually acuminate or apiculate, sometimes acute, retuse, or emarginate, the base acute or cuneate, frequently asymmetric, sometimes decurrent, the texture coriaceous to membranaceous, the primary vein ± prominent, the secondary veins (4 to)5 to 7(to 9), the tertiary veins reticulate or rarely percurrent, occasionally inconspicuous, the upper surface glabrous, rarely with multicellular incrustrations, the lower surface glabrous or with few trichomes on the veins; petiole 0.2–0.8(–1.2) cm long, slender, canaliculate on adaxial surface, glabrous or with few trichomes. Inflorescence (2–)3–5(–7) cm, terminal or sometimes axillary, comprising up to 10(to 15) flowers, but usually less, the branching sympodial, the branches slender or rarely robust, glabrous to varying tomentose, the bracts frequent, leafy, the bracteoles rare, if present small, lanceolate, velutinous. Flowers fragrant, the pedicels up to 3 mm, the buds widely obovoid; calyx (4–)5–7 mm long, campanulate or sometimes tubular, coriaceous, indurate and slightly striate in fruit, varying puberulent outside, varying tomentose at least at margin inside, the lobes 5, 1–3 mm long, acute or acuminate, usually regularly divided, but rarely irregularly (into 3+2 or 2+2+1) in fruit; corolla (10–)12–17 mm long, salverform, membranaceous, white, the tube 7–10 mm long, tubular or rarely funnel-shaped, usually glabrous on both surfaces, the lobes 5, 3–6 mm long, rounded or obtuse, papillose or with few strigose trichomes outside; stamens 5, included, the filaments (6–)7–9 mm long, completely adnate to the corolla tube, glabrous, the anthers 1(–2) mm long; ovary glabrous, the style (4–)6–8 mm long, includ-

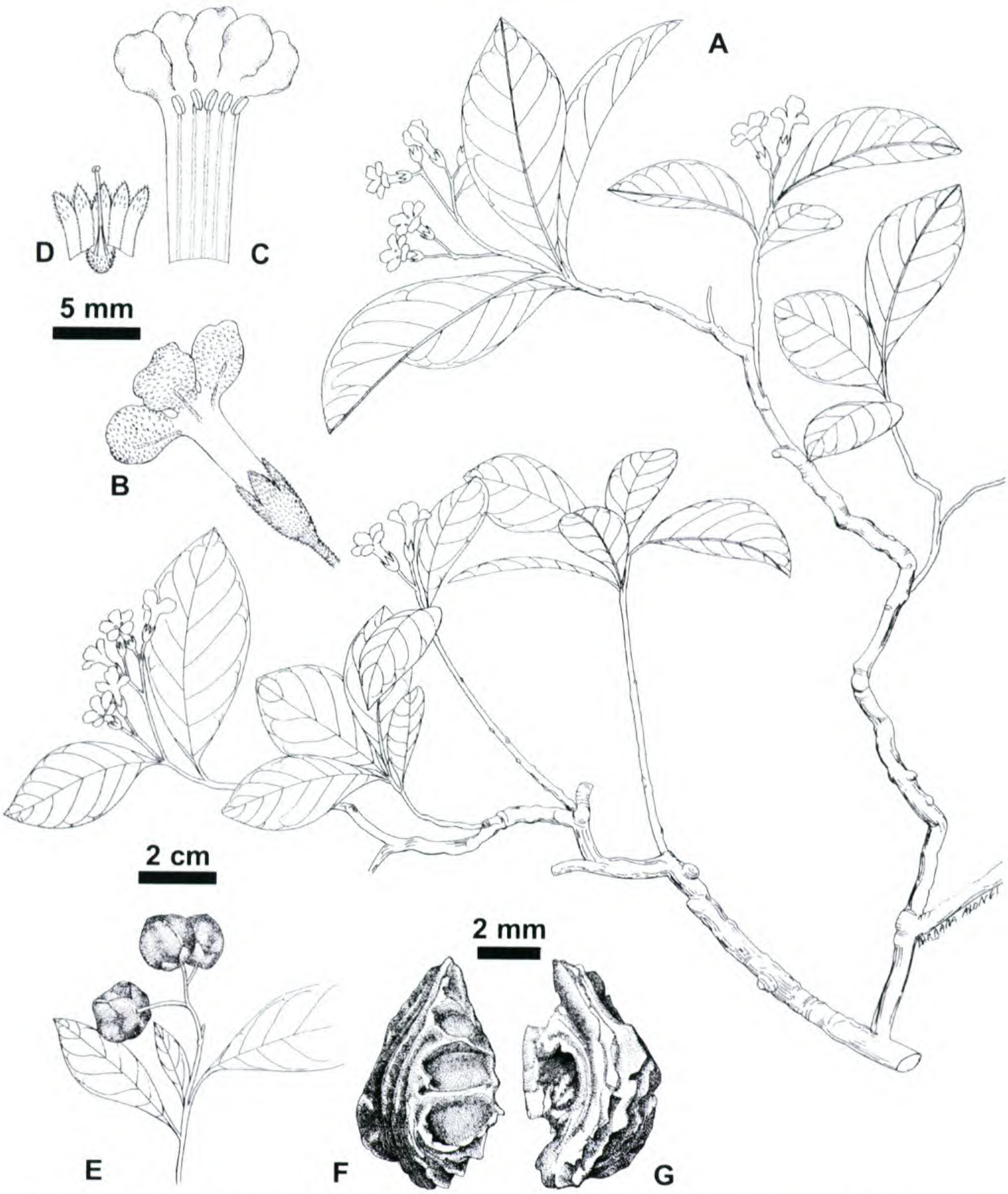

Figure 1. *Bourreria grayumii* Gottschling & J. S. Mill. —A. Flowering branch. —B. Flower (note the papillose outer surface of the corolla lobes and the strigose hairs on the outer surface of the corolla). —C. Open corolla with stamens (note that the filaments are entirely adnate to the corolla tube). —D. Open calyx with gynoecium. —E. Fruiting branch. —F, G. External surface of pyrenes showing overlapping lamellae. A and F, G from *Espinoza et al. 213* (MO); B from *Martínez 93* (MO); C, D from *Flores et al. 46* (MO); E from *Grayum et al. 9048* (MO).

ed, undivided, the stigma capitate, sometimes distinctively broader than the style; disc present. Immature fruits 9–14 × 10–15 × 9–14 mm, drupaceous, widely to depressed ovoid, ridged, the exocarp thin, the mesocarp scanty, the mature fruit schizocarpous; pyrenes 8–9 × 4 × 4–5 mm, each one quarter sphere in shape, the abaxial surface with 5 to 6 conspicuous lamellae.

Etymology. This species is named in honor of Michael H. Grayum (MO), who collected the type as well as many valuable plant specimens in Costa Rica and has contributed greatly to our understanding of the Costa Rican flora.

Distribution. Bourreria grayumii occurs in southern Nicaragua and northern Costa Rica, usu-

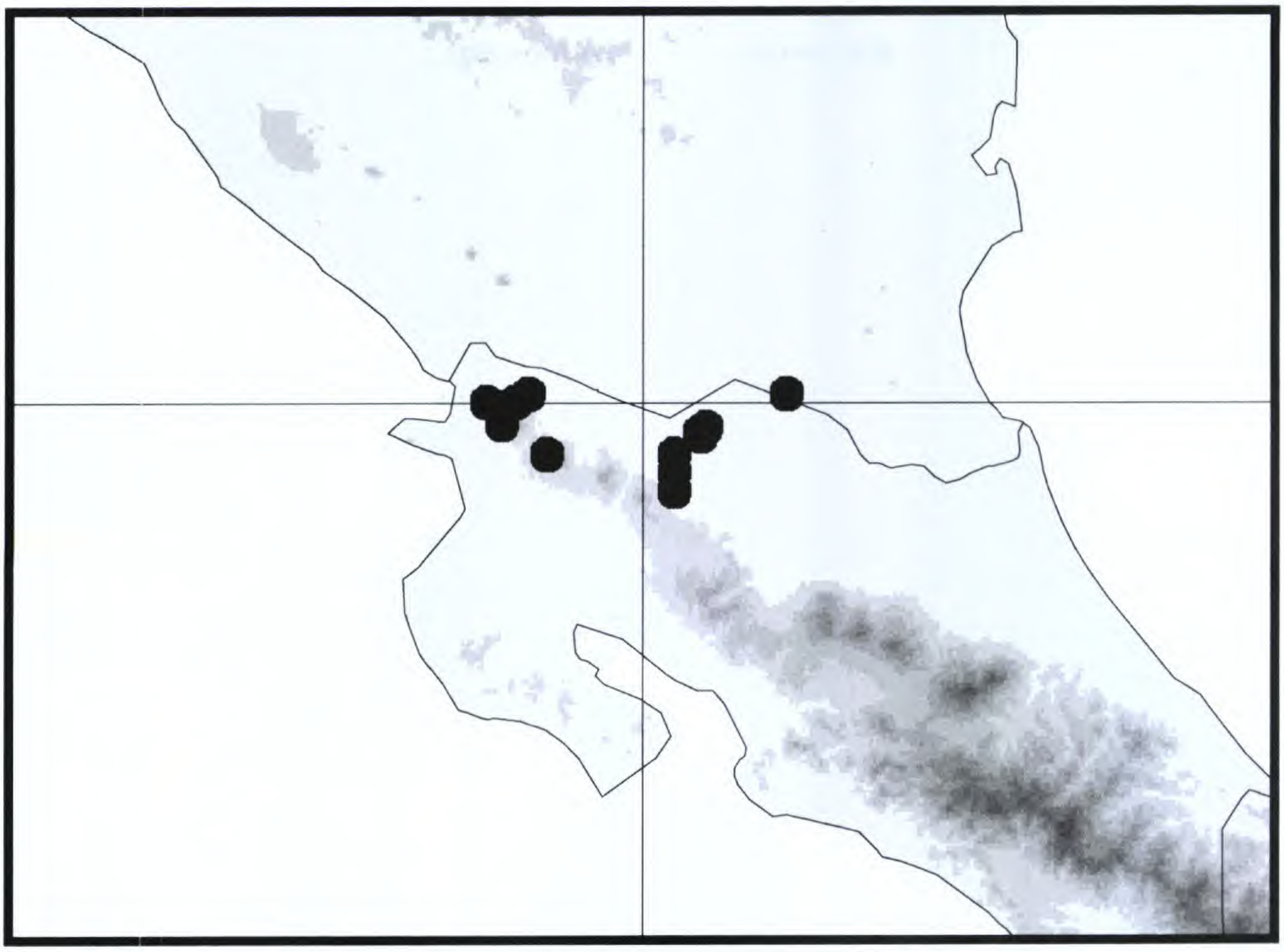

Figure 2. Distribution of *Bourreria grayumii* at the Nicaraguan–Costa Rican border.

ally at elevations of 40–100 m, but occasionally to 1100 m, and is sympatric with *B. costaricensis* (Standley) A. H. Gentry.

Notes. *Bourreria grayumii* has been considered closely related to *B. mollis* from the *Bourreria baccata* Rafinesque species complex comprising approximately four difficult to distinguish species [*B. baccata*, *B. mollis*, *B. polyneura* O. E. Schulz, and *B. virgata* (Swartz) G. Don]. They are similar in general morphological appearance and have some overlapping morphological features that are also shared by *B. grayumii* at first glance. Fruiting collections of *B. grayumii* show that the mature fruit is schizocarpous, and even its immature fruits have both a ridged surface and a somewhat four-angled shape. Schizocarpous fruits in *Bourreria* break into four separate mericarpids at maturity, and each of them has a filament connecting the gynobase with its apex. This character appears to circumscribe a monophyletic species group (Gottschling, 2004) that occurs from Mexico to northern South America and was recognized as *Crematomia* by Miers (1869). *Bourreria grayumii* would be unique among those species in exhibiting stamen filaments completely adnate to the corolla tube.

Paratypes. NICARAGUA. **Río San Juan:** Sábalo, San Antonio, 1 km W of Sábalo, *P. P. Moreno 26240* (MO, US). COSTA RICA. **Alajuela:** Guatuso, Cabaña, near Río Buena Vista, *Q. Jiménez, R. Quesada & R. Castro 1133* (CR, MO); Los Chiles, Llanura de Guatuso, R.N.V.S. Caño Negro, San Antonio, *K. Flores et al. 46* (CR, ENCB, MO), *K. Flores & K. Flores 114* (ENCB, MO), *K. Martínez 88* (CR, MO), *K. Martínez 93* (CR, ENCB); Upala, Canalete, *Jimenez-Saa 125* (F). **Guanacaste:** Parque Nacional Guanacaste, Cerro El Hacha, *R. Espinoza 131* (CR, MO); Estación Maritza, *Espinoza et al. 213* (CR, ENCB, MO).

Acknowledgments. We thank Roy Gereau (MO), who reviewed the manuscript and corrected the Latin description of *Bourreria grayumii*, the editor Victoria Hollowell (MO) for improving a first draft of the manuscript, and Barbara Alongi (MO) for the excellent drawings. A portion of this work was supported by a fellowship within the Postdoc-Programme of the German Academic Exchange Service (DAAD).

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Studies in Capparaceae XXII. *Capparis sclerophylla*, a Novelty from Arid Coastal Peru and Ecuador

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Abstract. *Capparis sclerophylla* (subg. *Cynophalla*), Capparaceae, a sharply distinct new species of shrub or small tree, differs from other, often dominant, related, but often difficult to distinguish species of subgenus *Cynophalla* by thick, hard, stiff, xerophyllous leaves, these subsessile on short (1–4 mm), dark-brown to black, rigid and fragile petioles; by large white flowers spirally disposed with reflexed petals usually borne on thick, congested, short, and rigid raceme axes; by long-gynophored, usually slender siliques with white pulp, white seed arils and green embryos; and by its restriction to arid deciduous thornscrub near the Pacific Ocean from northwestern-most Peru to west-central Ecuador. Its closest relative appears to be *C. verrucosa* of Mexico to Venezuela. A cytotaxonomic survey of subgenus *Cynophalla* proves it to be a polyploid series, with base number of $n = 14$, $2n = 28$ ($x = 14, 28, 56, 84$), represented by *C. flexuosa* and other species; several of these chromosome numbers are reported here for the first time, but the number for *C. sclerophllya* is as yet unknown.

Resumen. *Capparis sclerophylla* (subg. *Cynophalla*), Capparaceae, es una nueva y claramente distinta especie de arbusto o arbolillo que difiere de las otras especies del subg. *Cynophalla*, frecuentemente dominantes, relacionadas, pero usualmente dificiles de distinguir, por poseer hojas xerófilas, rígidas, gruesas, subsésiles, con pecíolos muy cortos (1–4 mm), rígidos, frágiles, de color café-obscuro a negro; grandes flores blancas con pétalos reflexos que nacen en los ejes gruesos, cortos, rígidos y sésiles de los racimos congestos; silicuas delgadas con ginóforos largos, pulpa y arilo de la semilla blancos y embriones verdes; y por estar restringida al monte espinoso y bosque muy seco deciduo, cerca del Oceano Pacífico, en la costa del noroccidente de Perú hasta el oeste-central de Ecuador. Su pariente más cercano parece ser *C. verrucosa*, distribuida desde México hasta Venezuela. Un estudio citotaxonómico del subg. *Cynophalla* demuestra que es una serie poliploide, con un número base de $n = 14$, $2n = 28$ ($x = 14, 28, 56, 84$), representada por *C. flexuosa* y otras especies; se presenta algunos de estos números cromosómicos aquí por primera vez, pero el número de *C. sclerophylla* es aún desconocido.

Key words: Capparaceae, *Capparis*, chromosome number, coastal Peru and Ecuador, endemic, extra-floral nectaries, myrmecotrophic, subgenus *Cynophalla*, xerophyte.

As a consequence of the dramatic rainshadow created by the upwelling cold waters of the Peru (or Humboldt) Current precipitating the humid, Pacific "westerlies," the coastal regions of western Peru and Ecuador south of the Equator are covered by a widespread arid belt of xerophytic vegetation: mostly deciduous thornscrub with columnar ceroid cacti, semideciduous woodlands and seasonally dry tropical forests, in which various species of *Capparis* are not only common, but characteristic and often dominant. Here one finds such highly distinct, stellate- or lepidote-pubescent species as *C. scabrida* Kunth (*C. angulata* Ruiz & Pavón ex DC.), *C. crotonoides* Kunth (*C. cordata* Ruiz & Pavón ex DC.), and *C. avicennifolia* Kunth (*C. ovalifolia* Ruiz & Pavón ex DC.), as well as many species of the glabrous or barely pilose taxonomically difficult *Capparis* subg. *Cynophalla* (DC.) Eichler (Eichler, 1865), this nevertheless a well-defined group characterized by: (1) distichous and divergent, evenly spaced out, subsessile leaves; (2) each leaf subtending an ascending series of one to three, char-

acteristic axillary, nectar-producing glands (Poulsen, 1879–1880; Di Sapio et al., 2001) visited by ants; (3) large, round, cup-shaped sepals in two unequal decussate series, with the inner the larger; (4) elongate, torulose, dehiscent siliques, each with several to many seeds embedded in a fleshy orange, red, or white pulp (endocarp); (5) seeds covered by a paper-thin testa, and this in turn enclosed by a white aril, with both together readily slipping off the naked green embryo; and (6) plants that are mostly glabrous or at best only minutely puberulent or pilose with simple short, soft trichomes. Included here are two closely related, rather thin-leaved species, *C. heterophylla* Ruiz & Pavón ex DC. and *C. ecuadorica* Iltis (Iltis, 1978). In addition there are several taxa of a notoriously variable complex of intergrading taxa from western Ecuador (the polyploid *C. flexuosa* (L.) L., s.l. complex; cf. Iltis, below and 1978; Madsen et al., 2001), the nomenclature of which in many regions has yet to be worked out: the infrequent *C. didymobotrys* Ruiz & Pavón ex DC.; the ubiquitous and enormously variable *C. guayaquilensis* Kunth and the usually more southern, less common variant of the latter; *C. mollis* Kunth; and their diverse segregating progenies of some putative, presumably ancient, hybridization events.

Intermixed and hidden in all this impossible diversity within *Capparis* subg. *Cynophalla* was an unknown, usually a sterile member of *Cynophalla*, superficially resembling in leaf shape *Capparis guayaquilensis* (= *Capparis lanceolata* Ruiz & Pavón ex DC., and so cited by Madsen et al., 2001: 153–155), one that heretofore had escaped notice and is herewith newly described as *Capparis sclerophylla*. A closer examination revealed that its leaves are remarkably hard, stiff, and evergreen, and are subsessile, when dry on dark brown or black, short, thick, rigid, fragile petioles. As a consequence, its leaf blades do not hang loosely down as in some other, sympatric species in this subgenus, but diverge laterally and break off when dry at the slightest touch. Most significantly, its large, pure white flowers with reflexed petals are usually borne on thick, congested, stubby short shoots or spurs (i.e., peduncles) mostly no more than a centimeter long, these produced at the end and sides of older branches and unique in subgenus *Cynophalla*. Occasionally, flowers are spaced out on young leafless long shoots more typical of the subgenus. Finally, the scarce pulpy endocarp is said to be white rather than red, a condition duplicated only in the widespread *C. verrucosa* Jacquin of Mexico to Venezuela, for this and other reasons the closest relative of *C. sclerophylla*. Abundantly distinct, it is thus gratifying to be able to segregate still another species out of the polyploid taxonomic jungle that is the *Capparis* subg. *Cynophalla* (Iltis, 1978; Ruíz-Zapata & Iltis, 1998: 139; Iltis, unpublished).

Capparis sclerophylla is relatively uncommon, flowers infrequently, and only rarely sets fruit. When sterile specimens were collected by the first author near Bahía de Caráquez, these were initially taken to be aged, xeromorphic extremes of a variable population of the similar *C. guayaquilensis*, a much more common species with which it grew intermixed. But once the taxon is recognized, the petiolar characters alone readily distinguish it. Finally, the recent splendid fertile collections of Ecuadorean capparids, sent to the University of Wisconsin Herbarium (WIS) from the rejuvenated Universidad de Guayaquil Herbarium (GUAY) by Carmen Bonifaz and the second author, have made it obvious that this taxon deserves a binomial of its own. Focusing on its distinctive sclerophyllous leaves, we name it:

Capparis sclerophylla Iltis & X. Cornejo, sp. nov.
TYPE: Ecuador. Manabí: Bahía de Caráquez a 8 km, alrededores de Univ. Católica, 80°32′W, 00°45′S, monte espinoso/bosque muy seco tropical deciduo, fuertemente intervenido, 30 m, 27 Oct. 1997 (fl, fr), *X. Cornejo & C. Bonifaz 5822* (holotype, WIS; isotypes, AAU, B, COL, DAV, F, GB, GH, GUAY, K*, LOJA, MA, MEXU, MO*, MY, NY*, P, QCA, QCNE*, RSA*, SBT, UC, US*, USM, VEN, WIS [3]. [Some specimens incomplete, but all supplemented by a suite of xerox reproductions of flowering and/or fruiting isotypes; specimens with an asterisk (*) include a wood sample.] Figures 1–3.

Fruticosa 0.5–5 m alta, *C. guayaquilensi* similis, sed foliis insigniter duris, petiolis atrofuscis vel nigris, brevioribus (2–3 mm longis) et fragilibus in sicco, floribus grandibus (20–30 mm longis) cum petalis reflexis et axibus floriferis brevibus, densis et condensatis differt.

Xeromorphic shrubs to small slender trees, 0.5 to 5 m tall and 10 cm DBH, with many leaves evenly spaced on the current year and several previous years' growth, somewhat distichous to mostly irregularly stiffly diverging in all directions but never all drooping together, the branchlets lenticellate; plants glabrous when mature, but young branches, petioles, and leaves sometimes with a fine pubescence of very short, simple trichomes. Leaves evergreen, thick, hard, stiff, entire, narrowly oblong to elliptic, less often linear-lanceolate to oblanceolate or obovate, highly variable in size and shape (e.g., in one extreme case, 8 × 1.4 cm leaves

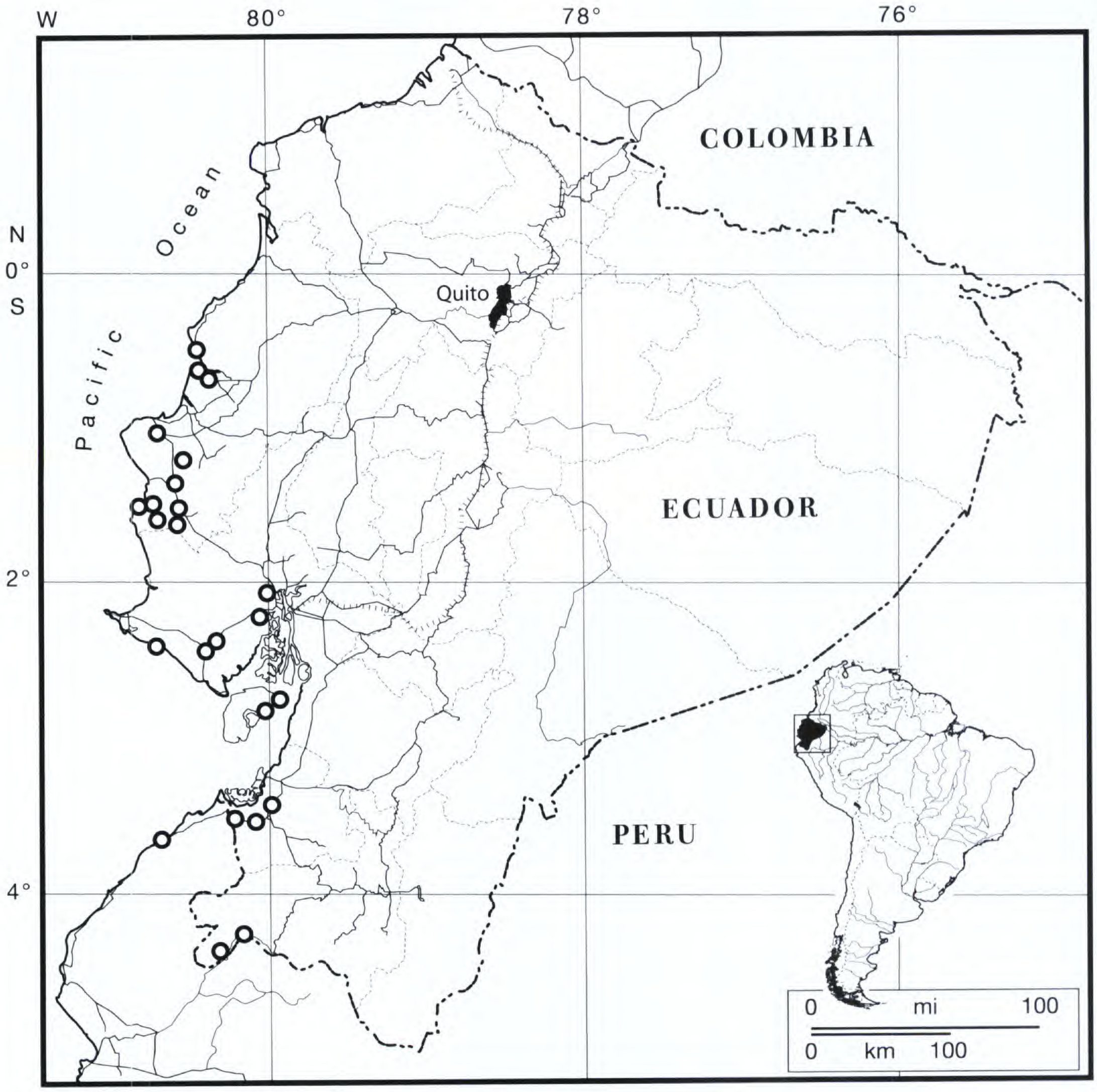

Figure 1. *Capparis sclerophylla*. Geographic distribution from northwesternmost Peru and western Ecuador.

adjoining some 28 × 5.5 cm), those on sprout-shoots often narrowly to broadly linear, (5–)7–9(–15) × (1–)2–3(–4) cm or even 20 × 1 cm, dark olive-green above, very light pale green beneath, glabrous when mature, or occasionally with a soft short dense puberulence on midrib and blade beneath but barely so above, the apex acute to obtuse, rarely rounded or emarginate, apiculate, the base subsessile, cuneate to rounded or subcordate (i.e., viewed from above, subpeltate, with leaf lobe margins overlapping and almost confluent below the petiole insertion); lateral veins 7 to 12 on each side of the midrib, somewhat elevated on both sides, the midrib beneath strongly elevated, yellow, changing abruptly into the dark brown to black petiole (rarely green, at least in the herbarium); petioles very short, (1–)2–3(–4) mm, when fresh with 20 or more deep transverse fissures, when dry extremely brittle and readily breaking from the branch at the slightest touch (hence many if not most herbarium specimens leafless), subtended by paired, thin, triangular, apiculate, ± caducous stipules ca. 1–2 mm wide; glands above the leaf axils on very young branches 1(to 3), increasing in size upward in a vertical row, sessile, subspherical, 1–2 mm diam., composed of 2 pairs of decussate, fleshy bracts (the outer larger) enclosing a brown, nectar-producing center, subtended by a pair of round-apiculate, pale and marcescent stipules, on the older, pale gray to pale brown branches often solitary and soon becom-

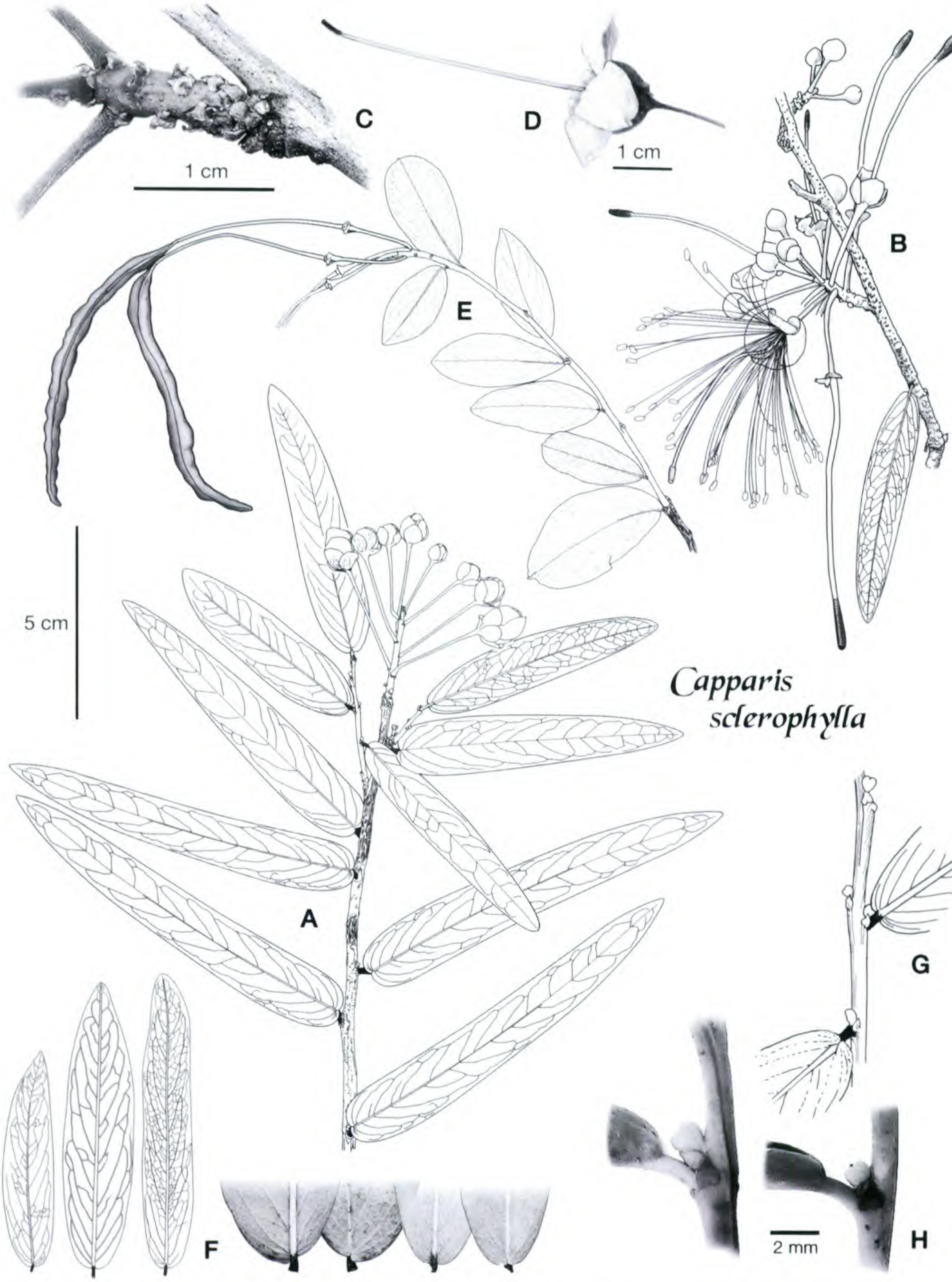

Figure 2. *Capparis sclerophylla* Iltis & X. Cornejo. —A. Branch with flower buds on short leafless terminal long shoot. —B. Detail, with flowers on condensed short-shoot raceme axis or peduncle. —C. Condensed short-shoot peduncle showing 3 terminal pedicels and many old spirally disposed pedicel bases with associated stipules and bracts. —D. Open flower with stamens fallen off one day after anthesis. —E. Leafy, elongate, long-shoot branch bearing four fruits (only two shown). —F. Leaves showing short black petioles: three drawings (left) and photos of two paired leaves (right), left of each pair showing underside, right of each pair, upper surface with subpeltate insertion. —G. Leaf bases, with underside (right), and upper surface (left) with subpeltate insertion. —H. Close-up photo of 2 leaf nodes of very young shoot, each with a stipulate petiole, its leaf base, axillary bud, and extra-floral nectary. (A–H, from the type, *Cornejo & Bonifaz 5822*.)

Figure 3. *Capparis sclerophylla*.—A, C. Habitat, ca. 5 km ESE of Bahía de Caráquez, at Sitio Mauricio, close to the type locality in Ecuador. View of vegetation with *Pilosocereus tweedianus* (Britton & Rose) Byles & G. D. Rowley (Cactaceae), the smooth bark of *Cochlospermum vitifolium* (Willdenow) Sprengel (Bixaceae), *Ceiba trichistandra* (A. Gray) Bakhuizen (Bombacaceae, shown in center of A), and leafy branch of *C. sclerophylla* (lower center of C). —B. Flowers on short-shoot raceme axis. (Photos: A, C, Iltis; B, Cornejo.)

ing obsolete and barely recognizable as small, eroded axillary pits. Racemes terminal, subterminal and/or lateral, mostly on old branches, their axes (peduncles) of two sorts: most commonly (1) lateral or subterminal short shoots or spurs on old wood of leafy branches, ± highly condensed and congested, thick, stubby and sessile (never slenderly zig-zag), 5–11(–22) mm long, 2–4 mm thick, green when young or, if old, grayish and scruffy or scaly and covered with paired, round to triangular, apiculate stipules and bract surrounding (3 to)6 to 12 or more old pedicel scars or aborted flower buds; when peduncles lateral, then solitary or in twos or threes, when terminal or subterminal, solitary or in twos to fives, these often then tightly clustered on the old wood, each bearing up to 3 to 6 or more flower buds, the larger peduncle clusters at anthesis with as many as 25 flower buds arranged in a compound umbelliform false "panicle," but with only a single flower of each individual peduncle open at one time; or finally, less commonly and sometimes together with, but exceeding in length, the above condition: (2) slender and uncongested, solitary, leafless new-growth (long shoots) terminating new leafy branches or old leafy branches, in either case the peduncles (raceme axes) slender and smooth, uncondensed and mostly 20–50 mm long, ca. 2 mm thick, and ending in ca. 8 to 14 flower buds or flowers and/or pedicel scars arranged distichously as in a fan, and in addition, each with 3 to 6 axillary nectariferous glands (see above) clustered at or near the peduncle base, these *not* subtended by pedicels but only by minute, paired, pale, scarious, round to triangular stipules. Flowers showy, white, spirally disposed on ascending pedicels (14–)20–30(–44) mm long; calyx of 4 sepals in 2 unequal decussate-imbricate series, the smaller, outer ones 4–6 × 6–8 mm, the larger, inner 7–8 × 9–10 mm, green on the back, with thin, hyaline-papery, translucent margins, strongly cupulate, in bud nearly completely covering corolla, but just before anthesis tightly covering only ½ to ⅓; corolla buds at anthesis obovoid, ca. 15 mm diam., glabrous; receptacle obconic, topped by a circular fleshy disk 5–6 mm diam., its flat top with 4 nectar-producing depressions, the nectar very sweet. Corolla cruciform; petals pure white within, light green at base without, ovate to oblong, 23–29 × 9–17 mm, with rounded apex, the base broadly cuneate to rounded, subsessile and inserted into the disk by a short peg, the open flower ca. 15–20 mm across, with the upper half of the petals at nightfall becoming sharply reflexed over, and almost to the base of, the sepals; androgynophore absent, the androecium base forming a ring around the base of the gynophore in the center of the disk; stamens 40 to 70, filaments pure white, glabrous to the very base, subequal, 45–70 mm long, in bud spirally disposed around the style, at anthesis in a pincushion funnel with ca. 90° divergence; anthers 2–3 mm long; gynophore white, becoming dark purple with maturity, 45–65 mm long; ovary green, narrowly oblongoid, 5–7 mm long, with a hemispherical stigma, the gynophore and ovary exceeding the stamens. Siliques 1 to 4 (rarely to 6) per raceme, usually densely clustered on the short shoots (or more distant on the more uncommon slender terminal peduncles), linear-cylindric, 6–14(–20) × 0.8–1.2(–1.5) cm, smooth and glabrous, usually ± torulose (constricted around seeds, but see below), yellow-brown to purple, or green streaked with dark red to purple, when mature each continuous with its slightly curved, slender to stout, 6–9 cm long gynophore and its (1.3–)2–3(–4) cm long pedicel, with the 2–4 mm long, 6–8 mm wide receptacle in between; seeds mostly (2–)6–12(–14), usually single-rowed or occasionally 2- or 3- or rarely 4-rowed and square in cross section, gigantic to 20 × 1.5 cm, ca. 60 [*Cornejo & Bonifaz 7154* (WIS)]; seeds 6–15 × ca. 5–7 mm, the testa paper thin, dark brown, surrounded by a white, oily aril, both together (unlike seeds of all other species in subg. *Cynophalla*, except *C. verrucosa*) embedded in the apparently white pulpy endocarp, with aril and testa together presumably slipping off easily under pressure exposing the naked, green, ready to germinate embryo; seeds sometimes hanging on for a short period by a slender thread from the thin, valve-embedded replum; embryo slightly curved, but essentially straight.

Distribution and habitat. Northwesternmost Peru (Tumbes) to northwestern coastal Ecuador (Provinces of Loja, El Oro, Guayas, and Manabí as far north as "El Recreo" [(just south of Canoa and north of Bahía de Caráquez), a beach house labeled "El Recreo" on the second floor and still standing in 1977, made famous by the Danish plant explorer Baron von Eggers (Eggers, 1894; Iltis, 1978)], in a variety of xerophytic, super-dry coastal vegetation types, from deciduous thornscrub or monte espinoso, to semi-evergreen dry forest (bosque muy seco–seco), savanna or bushwood, to tropical deciduous forest, from sea level to 600 m.

"The habitat of *Cornejo & Bonifaz 5822* (the type collection) is a very disturbed, open, sunny, very dry tropical forest, with dense scrubby shrubs less than 2 m high and very few scattered trees, in which *C. sclerophylla* is a frequent shrub associated with *Cordia lutea* [Lamarck], *Mimosa debilis* var. *aequatoriana* [(Rudd) Barneby], *Capparis crotono-*

ides, C. scabrida, C. heterophylla, C. guayaquilensis, C. didymobotrys, Cucurbita ecuadorensis [Cutler & Whitaker], *Ipomoea nil* [(L.) Roth], *I. hederifolia* [L.], and *Jacquemontia* [Choisy] sp. In other small remnant forests nearby, mature individuals of *C. sclerophylla* ranged from shrubs to 4–5 m tall and 10 cm dbh treelets, that are associated with *Tabebuia chrysantha* [Nicholson], *Caesalpinia glabrata* [Kunth], *Achatocarpus pubescens* [C. H. Wright], *Bursera graveolens* [Triana & Planchon], *Eriotheca ruizii* [(K. Schumann) A. Robyns], *Geoffroea spinosa* [Jacquin], and *Bonellia sprucei* [(Mez) Ståhl & Källersjö]" (letter to Iltis from Cornejo & Bonifaz, 5 Nov. 1997).

Phenology. Flowering from October into March (May), fruiting mostly from (October) December to April.

Local names. Fresno (Spanish), *Vivar et al. 883* (Loja); Patacón (Spanish), *Iltis 168* (Manabí); Sebastián (Spanish), *Iltis 168* (Manabí), *Madsen 63781, 63782* (Guayas); Vaina morada (Spanish), *Hernández et al. 222* (Manabí).

Local uses. For construction, firewood, and charcoal (Madsen et al., 2001).

Discussion. *Capparis sclerophylla* is vegetatively easily recognized by the thick, stiff, variously divergent, dark olive-green leaves on short (1–4 mm) dark brown to black petioles. In other respects it is rather similar to various forms of *C. guayaquilensis*, but the latter have relatively thinner and more flexible leaves that on drying become dark reddish brown or mahogany, and are borne on more flexible, slender petioles 6–10 mm long, from which the leaves usually hang down loosely, on either side of the branch. When in flower or fruit, or leafless, the densely congested, short-shoot peduncles, 2–4 mm thick and usually less than 20 mm long, immediately identify *C. sclerophylla*, while most others in subgenus *Cynophalla* have slender, flexible, often pronounced flexuous (zig-zag) raceme axes on which the flowers or flower buds are well-spaced out and 5–10 mm apart. Like all species of *Cynophalla, C. sclerophylla* is characterized by 1 to 3 cauline "glands" or extra-floral nectaries (Poulsen, 1879–1880) in the axil of leaves and/or at the base of the leafless terminal raceme axis (see above), which together with the young leaves are visited by vast numbers of ants of at least three taxa (Cornejo, pers. obs.).

Among its close relatives, *Capparis sclerophylla* is morphologically the most highly specialized xerophyte, judging from the thick, evergreen leaves, the congested short-shoot peduncles and the short petioles, the latter shared only by another mostly coastal species, *Capparis verrucosa*, widespread from western Mexico to coastal Venezuela. This species not only shares with *C. sclerophylla* the strongly recurved petals of the open flower, but also the color of the fruit pulp, which in both species is apparently white rather than the typical bright orange, red, or purple of all the other *Cynophalla* species. Whether this white pulp reflects an adaptation to bat seed dispersal during the night is not known, but deserves investigation.

The unique relationship of these two clear-cut species, *Capparis sclerophylla* and *C. verrucosa*, is strengthened by an easily overlooked floral character, the presence or absence of pubescence at the base of the staminal filaments. While most of the taxa of the *Capparis flexuosa* s.l. complex (e.g., *C. flexuosa* s. str., *C. polyantha* Triana & Planchon, *C. declinata* Vellozo, *C. mollis, C. guayaquilensis, C. didymobotrys, C. tarapotensis* Eichler, *C. retusa* Grisebach, etc.) have a dense, short, glandular pubescence covering the basal ⅕ or so of the staminal filaments, *C. sclerophylla* and *C. verrucosa* lack this peculiarity, what with their filaments being completely glabrous to the very base.

There are two exceptions within the *Capparis flexuosa* s.l. complex. First of all, the condition is variable in *C. hastata* Jacquin f. *coccolobifolia* (Martius) Dugand & Iltis, a relative of *C. flexuosa* s. str. that appears to hybridize with it (Iltis, 1991), with staminal filaments pubescent in ca. one-fifth of the specimens and totally glabrous in the rest. *Capparis hastata* is apparently the only species in the *C. flexuosa* group that regularly has glandular pubescent ovaries and gynophores. Second, and more interesting, is the lack of filament pubescence in a closely related, but quite distinct, species pair of subgenus *Cynophalla*: *C. heterophylla* and *C. ecuadorica* (Iltis, 1978). Though related to subgenus *Cynophalla*, they do not belong with the *C. flexuosa* s. str. alliance, and their relationship to *C. sclerophylla* and *C. verrucosa* is rather distant. It may be worth mentioning, however, that much like *C. sclerophylla*, both *C. heterophylla* and *C. ecuadorica* are also restricted to the lowlands on the western side of the Andes and nearly endemic to Ecuador.

Finally, similar in leaf shape is *Capparis flexuosa* s. str., a shrub widespread from Florida, the Caribbean and Central America to Venezuela and the Brazilian Islas de Noronha in the Atlantic Ocean. While the leaves of *C. flexuosa* are generally quite flexible, the fruit shape resembles that of *C. sclerophylla*. It is of interest that *C. flexuosa* is also characterized by a few large flowers at the end of its

branches and weak, lianoid "leaning" stems, which may also occur in *C. sclerophylla*, with one of its collections (*Plowman et al. 4610*) even called a "vine." Considering that the habitat of *C. sclerophylla* is often heavily disturbed by the gathering of firewood, animal grazing, or forest clearing through burning, we also have often seen its flexible slender branches sprawling like a vine over nearby vegetation (Cornejo, pers. obs.).

The relative rarity of *Capparis sclerophylla*, and the infrequency of its flowering or fruiting, may be related to such disturbance. Furthermore, the second author has often observed its firewood-trimmed shrubs in secondary vegetation overwhelmed by dense layers of vines, often of the endemic *Cucurbita ecuadorensis*, which, whenever such nest-like tangles were lifted off from these bushes, revealed the presence of usually sterile specimens of our new species underneath. Evidently, the treelet growth form is more to its reproductive optimum.

Biological interactions. The flowers of *Capparis sclerophylla* are visited by bees and ants in the early evening (Cornejo, pers. obs., 6:05 p.m.–6:30 p.m.) and also by bumblebee nectar thieves that do not penetrate the flower but bite a hole at the base of the flower to get at the nectar. The flowers produce a very sweet nectar by 7:30 p.m., becoming fragrant around 8:00 p.m., and stay open all night. Next day, once the sepals, petals, and stamens have fallen, the nectaries, as well as the axillary glands, are extensively visited by ants (Cornejo, pers. obs.). The pollinators are unknown, but probably include bats.

Cytotaxonomy of Capparis *subg.* Cynophalla. Clear evidence for hybridization or introgression with other species is lacking, even though *C. sclerophylla* quite frequently occurs together with one or more species of the subgenus. Some species groups within subgenus *Cynophalla* appear to be part of a polyploid series, and others are homoploid. Herein may lie the cause of both the distinctness of *C. sclerophylla*, whose chromosome number is as yet unknown, and the taxonomic problems due to putative hybridization between the closely related *C. guayaquilensis* and *C. mollis* of the Pacific slope of Ecuador and Peru. Despite *Capparis* chromosomes being very small and difficult to study, counts by Batia Pazy (in Iltis, 1978, vouchered in WIS) for *C. ecuadorica* indicated ca. $n = 25–26$ (probably 28, i.e., a tetraploid $2n = 56$, based on *Iltis 196*) and for the related *C. heterophylla*, ca. $2n = 70–80$? (perhaps a hexaploid $2n = 84$, based on *Iltis 207*), these two an isolated species pair essentially endemic to Ecuador.

A similar species pair of *Capparis* subg. *Cynophalla* from Pernambuco in eastern Brazil, both part of the *Capparis flexuosa* complex, revealed a plant with fruits similar to those of *C. hastata* f. *coccolobifolia* (listed in Costa e Silva, 1995, as "*C. cynophallophora*") with a chromosome count of $2n = 28$, while another sympatric species within the *C. flexuosa* complex from eastern Brazil, *C. declinata* (listed as "*C. flexuosa*"), had a tetraploid count of $2n = 56$ chromosomes (Costa e Silva, 1995: 58–61). Finally, $n = 14$ has been reported for *C. flexuosa* s. str. from Dominica (Ernst in Iltis, 1991). Previously unreported are the following additional $n = 14$ counts by Batia Pazy for species of subgenus *Cynophalla* (Iltis et al., 1985, unpublished, all vouchered in WIS): *C. flexuosa* s. str., Jalisco, Mexico (*Iltis 29195*); *C. declinata* (*C. flexuosa* s.l.), Bahia, Brazil (*Mori 11241*); *C. guayaquilensis*, Guayas, Ecuador (*Iltis E-10*); and *C. verrucosa*, Chamela, Jalisco, Mexico (*Bullock s.n.*, counted by S. Bullock, pers. comm. to Iltis). These chromosome numbers suggest genetic isolation of a putative diploid *C. sclerophylla* as supported by the morphological uniformity of *C. sclerophylla*, in contrast to the incredible intergrading variability observed among other sympatric taxa.

Paratypes. PERU. **Túmbes:** Küstenhalbwüste und Trockenwald-region, Tonnenbaum Mischwald [*Ceiba trichistandra* mixed forest], Cienego, just along coast S of Tumbes, *H. Ellenberg 1408* (U, GUAY photo, WIS); Zarumilla, pampas de Hospital, entre El Caucho y Cóndor Flores, *C. Díaz & R. Vázquez 3044* (MO, WIS fragm.); Zarumilla, region below El Caucho, *T. Plowman 5489* (GH, WIS photocopy). ECUADOR. **Loja:** In sector algodonal, entre Macará y Zapotillo, *P. Lozano & G. Lewis 702* (LOJA); Zapotillo, La Ceiba, *F. Vivar 883* (LOJA). **El Oro:** near Santa Rosa [fide catalogue], *F. Lehmann 7649* (K, WIS); 18 km SW of Santa Rosa, *C. Johnson 4238* (MO, WIS); rd. from Arenillas to Huaquillas, *T. Plowman, L. Jacobs & E. Davis 4610* (GH, S, WIS); 1 km NW of Arenillas on rd. to Huaquillas, *L. Albert de Escobar 705* (QCA, TEX, WIS); 2 km al sur de Chacras cerca a la entrada a Balsalito en la carretera de la Reserva Militar Arenillas, *H. Vargas, C. Canaday & R. Miranda 1171* (MO, QCNE, WIS). **Guayas:** Capeira, km 21 on rd. Guayaquil to Daule, *C. Dodson & A. Gentry 12619* (MO, SEL, WIS); Finca La Gloria, km 53 carr. Guayaquil–Playas, *X. Cornejo & H. Grochowski 7797* (GUAY, WIS); Guayaquil–Salinas rd., 1–5 km E of El Progreso, *G. Harling & L. Andersson 21118, 21129* (GB, WIS photocopy); *G. Harling & L. Andersson 21105* (GB, QCA); km 20 Guayaquil–Salinas rd, *G. Harling & L. Andersson 21041* (GB, QCA, WIS); Playas, Guayaquil, *G. Sánchez 2, 3* (WIS); km 17 de la vía Playas–Posorja, *C. Bonifaz 3639* (GUAY, WIS); Chanduy prope Guayaquil, [Feb.–Aug. 1862], *R. Spruce s.n.* (K, GUAY photo, WIS); Isla Puná, trail from Puná Nueva to Concordia, *J. Madsen, E. Madsen & E. Montero 85367* (AAU, QCA, WIS photo); vic. Puná Nueva tow. Zapote, *J. Madsen 64106* (AAU, WIS photo); El Placer, 0–5 km tow. Río Hondo, *J. Madsen 63942* (AAU, WIS

photo); path from Campo Alegre to Midway Río Hondo, *J. Madsen 63781, 63782* (AAU, WIS photo). **Manabí:** Cuenca del Río Ayampe, Cerro Cabeza de Vaca, *X. Cornejo & C. Bonifaz 818* (GUAY, WIS); Barbasmonte, *X. Cornejo & C. Bonifaz 1027* (GUAY, QCNE, WIS); Portoviejo–Jipijapa rd., 1 km S of La Pila, *G. Harling & L. Andersson 24824* (GB, WIS photocopy); rd. from Colimes de Paján to Jipijapa, *C. Dodson & L. Thien 1693* (WIS); Cerro Montecristi, 200 m, *X. Cornejo & C. Bonifaz 5917* (GUAY, WIS); N of Manta, 2 km from Montecristi, *C. Dodson & L. Thien 1750* (UC, WIS); Quevedo–Manta rd., 50.9 km W of El Empalme, *R. Sauleda, M. Ragan, H. Luther, R. Wunderlin, B. Hansen, L. Davenport & J. Wiersema 4023* (USF, WIS photocopy); Par. Nac. Machalilla, N de Puerto López, *X. Cornejo & C. Bonifaz 2322* (GUAY, QCNE, WIS); Estero Manta Blanca, S of Agua Blanca, *A. Gentry & G. Josse 72718* (MO, QCNE, WIS); Las Goteras, *C. Hernández 222* (QCA); Bahía de Caráquez, predios de la Univ. Católica, *X. Cornejo & C. Bonifaz 7154* (GUAY, WIS [2]); hills above Río Chone, just in back of Sitio Mauricio along main rd. 4 km SSE of Bahía de Caráquez, *H. H. Iltis & M. Iltis E-168* (QCA p.p., w/ *C. lanceolata*); 9 km N of San Vicente, *H. H. Iltis & M. Iltis E-208* (WIS [3]); Hcda. El Recreo, ca. 2 km along coast from Canoa, 18 km N of Bahía de Caráquez, *H. H. Iltis & M. Iltis E-216* (WIS [2]).

Acknowledgments. This paper has been fully 28 years in gestation. To the Nave Bequest for Latin American Studies, administered by the Dean of Letters and Science, University of Wisconsin, for partially supporting fieldwork in Ecuador during the summer of 1977, our thanks. Without fieldwork, no amount of dried herbarium material will substitute for viewing living flowers, fleshy, decomposing fruits, or the complexities of the ecosystems. One's obligations cannot be expressed deeply enough to that hardy soul who, helpful and uncomplaining, trudged along as field companion to the senior author (and once, literally, as a life-saver) in extremely hot, humid, or arid tropical habitats. So, special thanks to my assistant and son, Michael G. Iltis, who braved two months in Ecuador chasing *Cynophalla*'s, and saved that expedition in more ways than one. To Carmen Bonifaz, Director of the herbarium of the Universidad de Guayaquil, Ecuador (GUAY), and to the GAIA Foundation of Guayaquil, for supporting the collections of *C. sclerophylla*; to Flor Valverde and Florinda Triviño, professors of Botany emeritus at the Universidad de Guayaquil, for being helpful in many ways, botanically and otherwise; to Calaway Dodson and Alcides Mármol of the Río Palenque Biological Station, for their generous hospitality; to Craig McFarland, former Director of the "Fundación Charles Darwin para las Islas Galápagos," and his wife, for rescuing in 1977 two sick travelers and their huge, full plant presses; and to FUNDACYT of Ecuador, for support of the second author's air travel to Madison, Wisconsin; to all our sincerest gratitude. Finally, we are much obliged to Batia Pazy, superb cytogenetist of Jerusalem University, Israel, for several difficult-to-obtain chromosome counts; to Bernardette Costa e Silva, of the Universidade Federal Rural de Pernambuco, Recife, Brazil, for allowing us to publish her significant, previously unpublished chromosome counts; and to the unexcelled artist of the Botany Department, University of Wisconsin, Kandis Elliot for preparation of the splendid illustrations.

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Magnolia krusei (Magnoliaceae), una Especie Nueva de Guerrero, México

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RESUMEN. Se ilustra y describe a *Magnolia krusei* (Magnoliaceae), una especie nueva del estado de Guerrero, México. *Magnolia krusei* es afín a *M. iltisiana* A. Vázquez y a *M. tamaulipana* A. Vázquez, pero difiere de éstas por presentar flores y folículos de menor tamaño. También se incluye una clave dicotómica para distinguir las especies afines a este nuevo taxón.

ABSTRACT. *Magnolia krusei* (Magnoliaceae), a new species from the state of Guerrero, Mexico, is illustrated and described. It is related to *M. iltisiana* A. Vázquez and *M. tamaulipana* A. Vázquez, but differs from these by its smaller flowers and follicles. A dichotomous key for distinguishing all related taxa to this new taxon is also included.

Key words: Guerrero, *Magnolia*, Magnoliaceae, Mexico.

En el proceso de curación de la colección KRUSE del Herbario Nacional de México (MEXU), Instituto de Biología, UNAM, se detectó una especie de *Magnolia* que difiere en características de las hasta ahora conocidas, no incluida en el trabajo de Vázquez (1994), ni en trabajos posteriores de éste u otros autores.

Al examinar las primeras colectas (*Kruse* [*19630503–238*] y [*19750326–239*], MEXU), existían algunas dudas sobre la madurez de las flores, pues el reducido tamaño de los sépalos y pétalos podría atribuirse a un desarrollo incompleto, por ello, fue necesario colectar especímenes con flores indudablemente maduras. Además, fueron colectados frutos maduros e inmaduros para describir sus características de manera fidedigna.

Magnolia krusei J. Jiménez Ramírez & R. Cruz, sp. nov. TIPO: México. Guerrero: Mochitlán, San Roque, 17°21′34″N, 99°25′20″W, 1150 m, 26 Abr. 2003, *R. Cruz Durán & R. Fragoso Ramírez 5586 B* (holotipo, MEXU; isotipos, FCME, MO). Figura 1.

Arbor 6–10(–25) m alta; sepala 3, (3.2–)3.7–4.2 × 2 cm; petala 6, 3.4–4.3 × (1.4–)1.8–2.5(–2.8) cm; stamina (99–)120–161(–170); polyfolliculus globoso-oblongus cum 38–50 folliculis; folliculus 1.4–1.5 cm longus; semina (7–)8–9 × 5–6 mm.

Árbol de 6–10(–25) m de alto; tronco 50–100 cm d.a.p., ramificación desde los 1–2 m de altura; ramas con abundantes lenticelas blancas; ramillas lanoso-pubescentes, pubescencia blanca (verde pálido en seco), en ramas maduras la pubescencia persiste, pero adquiere una coloración negra; corteza gris-negra, lisa con algunas fisuras. Hojas alternas, coriáceas, elípticas a oblongo lanceoladas, hasta con 16 pares de venas secundarias, (11–)12–19.5 × (3.5–)4–8(–8.2) cm, ápice acuminado, ligeramente cuspidado (o muy rara vez agudo), base cuneada; pecíolo 1.5–2.5 cm de largo, canaliculado, pubescente; haz verdoso, glabro; envés lanoso-pubescente, pubescencia glauca con pelos largos y cortos; estípulas (2.4–)4.2–5.6 × 1.4 cm, blanco-pubescentes en la cara externa, (rojizas a café cuando secas), los pelos del ápice más largos. Flores terminales, solitarias (rara vez en un patrón racemoso), blanco-cremosas (amarillas según *Lozada 1810* o amarillas-crema según *Kruse* [*238*]), 6.5–7 cm de diámetro; pedúnculo (1–)1.2–1.6(–2.5) × 0.5–1.2 cm, lanoso-pubescente, pubescencia blanca (verde pálido cuando seco); botón floral 3–4 × 2–2.4 cm, ovado-elíptico, lanoso-pubescente, pubescencia blanca, brácteas 2, lanoso-pubescentes en la cara externa, glabras en la cara interna, la externa 3.7–4 × 3–4.4 cm; sépalos 3, oblongo-elípticos, blanco-cremosos en el haz (verde claro en el envés en flores jóvenes), consistencia carnosa, (3.2–)3.7–4.2 × 2 cm, haz glabro, pubescencia blanca en el envés (en algunos casos sólo pubescentes cerca de la base), margen ligeramente ciliado, no deflexos, más largos que los pétalos; pétalos 6, blanco-cremosos, consistencia carnosa, glabros, dispuestos dos series, los externos obovados, alternos a los sépalos, 3.4–4.3 × (1.4–)1.8–2.5(–2.8) cm, los internos lanceolado-obovados, opuestos a los sépalos, (3–)3.4–3.6 × 1.4–1.5 cm; estambres lineares, (99–)120–161(–170), 1.3–1.4 × 0.15 cm, ápice agudo, blanco (amarillo pálido

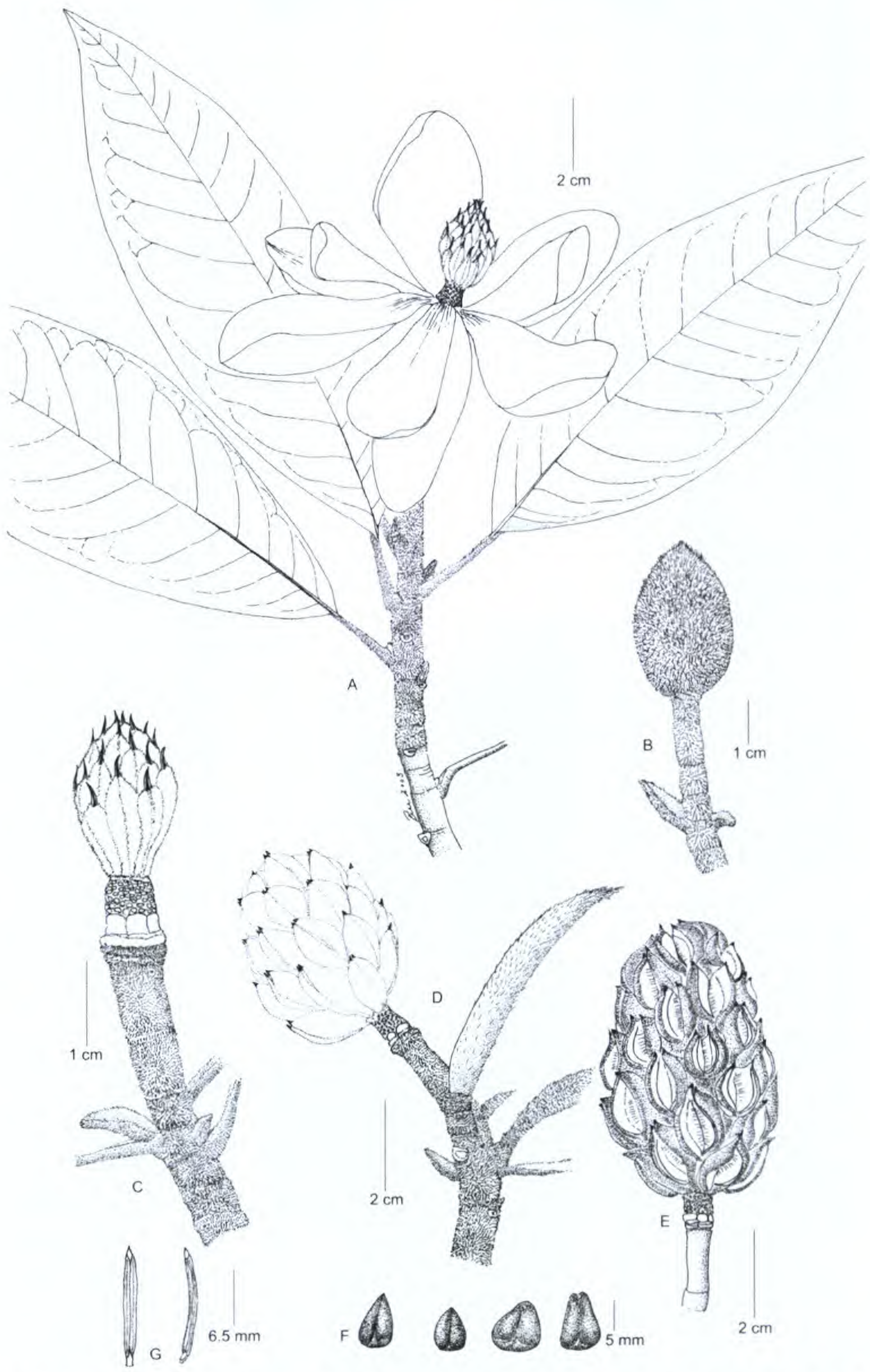

Figura 1. *Magnolia krusei* J. Jiménez Ramírez & R. Cruz. —A. Rama con flor. —B. Botón floral. —C. Gineceo. —D. Fruto inmaturo y estípula. —E. Polifolículo maduro. —F. Semillas, con y sin sarcotesta. —G. Estambres, vista ventral y lateral. A, E y G, *R. Cruz Durán & R. Fragoso Ramírez 5586 B* (FCME, MEXU, MO); B y F, *R. Cruz Durán & R. Fragoso Ramírez 5585 B* (FCME, MEXU); C y D, *R. Cruz Durán & A. González Zamora 5571* (FCME, MEXU). Ilustrado por Ramiro Cruz Durán.

cuando seco); gineceo oblongo, 2 × 1.2 cm, lanoso-pubescente, pubescencia blanca (verde pálido en seco), con estilos erectos, verde claro (café a negros cuando secos), estigmas amarillentos, ligeramente curvos. Polifolículo 5.2–5.7 × 3.4–3.8 cm, globoso-oblongo; folículos 38–50, 1.4–1.5 × 0.6–0.8 cm, elipsoides a oblongos, lanoso-pubescentes, pubescencia verde pálido, con estilos persistentes, erectos. Semillas triangular-deltadas, (7–)8–9 × 5–6 mm, café claro, 1 ó 2 por folículo (predomina generalmente una), con sarcotesta anaranjada-roja en fresco, con aroma a flor de *Annona*.

Fructificación. Noviembre–abril.

Floración. Abril–mayo (julio, ejemplares cultivados).

Distribución y habitat. *Magnolia krusei* se lo-

caliza en altitudes de 1140–1600 m (2000 m en un ejemplar cultivado: *A. Vázquez et al. 4901*, WIS), en restos de bosque de *Quercus* y bosque mesófilo de montaña.

En San Roque la población de *Magnolia krusei* es escasa, los individuos prosperan entre rocas de esquistos donde se retiene abundante humus y se asocia a *Quercus* sp., *Xilosma velutina* (Tulasne) Triana & Planchon, Melastomataceae, Rubiaceae, *Peperomia* sp., Compositae y Rhamnaceae. En Ximilcotitlán se pueden observar árboles de hasta 15 m de altura y un tronco de hasta 100 cm d.a.p., con algunas epífitas como *Anthurium* sp., *Vittaria* sp., y asociados a *Styrax* sp. y Verbenaceae. Aproximadamente 1 km al O de Ximilcotitlán se observaron numerosas plántulas de *Magnolia krusei* creciendo en la hojarasca de un bosque mixto de *Pinus* sp. y *Quercus candicans* Née.

Usos. Según informes de los habitantes de la región, una infusión de las flores frescas se utiliza contra los cólicos y dolores de estómago, y por su agradable aroma, tienen uso ritual y ornamental. En particular, los habitantes del poblado de San Roque mencionan que se está iniciando la explotación de esta especie con fines combustibles y señalan que las semillas son consumidas y dispersadas por aves como "*tenzapatos*", "*cardenales*", "*adrileños*" y "*jilgueros*". Los artesanos del poblado de Acahuizotla, Guerrero (donde no habita la especie nueva) utilizan su madera para la elaboración de utensilios domésticos como platos, saleros, cucharas, etc. Su nombre común es "Iolosúchil", "Yoloxochitl".

Epíteto específico. El nombre de esta especie honra al Ing. Hubert Kruse Robinett (1910–1984), por su metódica e invaluable labor botánica en la recolecta de ejemplares botánicos para el estado de Guerrero, México.

En los ejemplares de *Magnolia krusei* colectados por uno de nosotros (*R. Cruz Durán et al. 5585 B, 5587 B, 5588 B, 5938*) el color de los pétalos es blanco cremoso, pero, en los ejemplares de *Kruse* [*19630503–238*] la etiqueta dice amarilla-crema y en *Lozada 1810*, amarilla, lo que puede indicar que el color de la flor varía con la edad o que la percepción del color es distinta entre los colectores.

Magnolia krusei pertenece a la sección *Therhodon*, caracterizada por tener hojas perennes, estípulas libres, 2 brácteas, sépalos y pétalos subsimilares, estambres con el conectivo agudo a acuminado y anteras con dehiscencia introrsa. Es parecida a *M. iltisiana* A. Vázquez y *M. tamaulipana* A. Vázquez y puede distinguirse de ellas en la clave que se presenta a continuación.

Clave para Distinguir las Especies Afines a *M. krusei sp. nov.*

1a. Flores con diámetro de 11–15 cm; sépalos oblongo elípticos u oblongo obovados, 5–9.6 cm de largo; pétalos obovados, 5.5–9 cm de largo; folículo 2.4–2.7 cm de largo.
  2a. Envés de las hojas pubescente; sépalos 5–6 cm de largo; pétalos con el ápice agudo, todos con tamaño similar, 7–8 cm de largo; estambres 90–100, blanco cremosos; polifolículos subgloboso-oblongoides; folículo 2.4 cm de largo . . . . . *M. iltisiana*
  2b. Envés de las hojas puberulo; sépalos 6.5–9.6 cm de largo; pétalos con el ápice redondeado, los externos de 5.5–9 cm de largo, los internos de 4.5–6.5 cm de largo; estambres 140–145, con la base y el ápice púrpura; polifolículos ovoide-oblongoides; folículo 2.7 cm de largo . . . . . *M. tamaulipana*
1b. Flores con diámetro de 6.5–7 cm; sépalos oblongo elípticos, 3.7–4.2 cm de largo; pétalos exteriores obovados y los interiores lanceolados obovados, 3–4.3 cm de largo; folículo 1.4–1.5 cm de largo . . . . . *M. krusei*

Magnolia krusei difiere de *M. iltisiana* porque tiene las flores más pequeñas (6.5–7 cm, frente a 11–14 cm de diámetro), los pétalos exteriores e interiores de diferente forma y tamaño, todos con el ápice redondeado (frente a los pétalos totalmente similares en forma y tamaño, con el ápice agudo, de la segunda especie) y los botones florales ovado-elípticos (mientras que *M. iltisiana* los tiene ovado-oblongos), además, *M. krusei* presenta polifolículos globoso-oblongos y folículos de 1.4–1.5 cm de longitud, en cambio, *M. iltisiana* posee polifolículos subglobosos a oblongos y folículos de 2.4 cm de largo.

Magnolia krusei difiere de *M. tamaulipana* porque tiene las flores más pequeñas (6.5–7 cm, frente a 12–15 cm), los pétalos mas pequeños (3.4–4.3 cm, en contraste, con los 4.5–9 cm de la segunda especie) y los pétalos interiores lanceolado-obovados mientras que en *M. tamaulipana*, son obovados. Los estambres de la especie nueva son color blanco cremoso, así como la parte estaminada del receptáculo, en cambio, *M. tamaulipana* tiene el ápice y la base de los estambres púrpura, mismo color que presenta la porción estaminada del receptáculo. Los polifolículos de *M. krusei* son globoso-oblongoides y los folículos miden 1.4–1.5 cm de largo, en contraste, en *M. tamaulipana* los polifolículos son ovoide-oblongoides y los folículos miden 2.7 cm.

El examen de las imágenes digitales de dos paratipos de *M. iltisiana* (*Miller & Campos 2949*, WIS, colectado a 5 km de El Paraíso, Guerrero y *Vázquez et al. 4901*, WIS, colectado en Puerto del Gallo, de un árbol cultivado), permitió reubicarlos

en la especie nueva. Esta circunstancia, unida al hecho de que el resto de los paratipos de Guerrero de *M. iltisiana* (no vistos por nosotros) hallan sido recolectados en un área geográfica restringida (a 11 km o menos del poblado de Paraíso, Guerrero), hace suponer que todos pudieran pertenecer en realidad a *M. krusei*. Además, el ejemplar *Lozada 1810* (FCME), no visto por Vázquez (1994), designado ahora como paratipo de *M. krusei*, también fue colectado en la misma porción geográfica.

Paratipos. MÉXICO. **Guerrero:** Mochitlán, San Roque, 5 km ESE de Acahuizotla, camino a Ojo de Agua de San Francisco [Ximilcotitlán], 10 Nov. 2002, *R. Cruz Durán & A. González Zamora 5568* (FCME, MEXU, WIS), *5571* (FCME, MEXU), *5572* (FCME); San Roque, 26 Abr. 2003, *R. Cruz Durán & R. Fragoso Ramírez 5585 B* (FCME, MEXU), *5587 B* (FCME, MEXU), *5588 B* (FCME, MEXU), 12 Ene. 2005, *R. Cruz Durán 5938* (FCME); Ojo de Agua de San Francisco [Ximilcotitlán], Sierra Frente a Acahuizotla, 3 Mayo [1962 ó 1963], según diario de la época, fechado el 15 de Mayo de 1963, *Hubert Kruse [19630503–238]* (FCME, MEXU); Ximilcotitlán, 26 Mar. 1975, *Hubert Kruse [19750326–239]* (MEXU), 12 Ene. 2005, *R. Cruz Durán 5965* (FCME); 1 km al O de Ximilcotitlán, 12 Ene. 2005, *R. Cruz Durán 5959 B* (FCME); Atoyac de Álvarez, Nueva Deli, 4 km al S, 20 Mayo 1993, *L. Lozada Pérez 1810* (FCME); between Rio Verde and El Paraiso, a short dirt road (ca. 5 km off the road between El Paraiso and Atoyac), 23 Mayo 1987, *J. S. Miller & G. Campos 2949* (WIS); brecha Puerto del Gallo a Cruz de Ocote, 11 Jul. 1988, *A. Vázquez et al. 4901* (WIS).

Agradecimientos. Al Dr. Mario Sousa del Herbario Nacional (MEXU) por las facilidades otorgadas para la consulta del material de la COLECCIÓN KRUSE, a la Biól. Gloria Andrade por la información biográfica referente al Ing. Hubert Kruse Robinett, a la Biól. Ma. del Rosario García Peña, técnico académico del MEXU, por permitir la revisión de material en préstamo del género *Magnolia*, al M. en C. Lucio Lozada Pérez, quién proporcionó sus colectas de *Magnolia* del estado de Guerrero; a los Biól. Alberto González Zamora y Rogelio Fragoso Ramírez por la ayuda en el trabajo de campo, a la M. en C. Martha Martínez Gordillo la diagnosis en latín y al Biól. José Antonio Hernández Gómez de Microcine, Facultad de Ciencias, UNAM, la digitalización de la Figura 1. Y de manera especial al Dr. T. S. Cochrane por el envío de literatura e imágenes digitalizadas de material de herbario de *Magnolia* depositado en WIS.

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Two New Species of Myrtaceae from South America

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ABSTRACT. Two new species of Myrtaceae are described and illustrated, *Calycolpus aequatorialis* of Ecuador and *Psidium huanucoense* of Peru. *Calycolpus aequatorialis* appears to have a close relative in *C. surinamensis*, but differs in having a closed calyx, relatively little indumentum, and strongly 4-winged twigs. *Psidium huanucoense* is compared with the similar species *P. acutangulum* from which it differs in having velvety indumentum of short, yellowish, erect hairs and larger leaves. Comparison with *P. guineense* is also made, from which it differs in venation, number of ovules, anther length, and hair length.

Key words: *Calycolpus*, Ecuador, Myrtaceae, Peru, *Psidium*.

Calycolpus O. Berg is a genus of ca. 12 species ranging from Central America to Minas Gerais, Brazil, with the greatest diversity in northeastern South America in the Guayana Highlands (McVaugh, 1969). It is closely related to *Psidium* L. and distinguished from it by a combination of inflorescence, floral, and seed coat characters (Landrum & Sharp, 1989). For a few years I have been aware of an unusual species from northeastern Ecuador, known from a single collection, that I assumed belonged to *Psidium* because of its closed calyx and strongly 4-winged twigs, characters common in *Psidium*. These same characters were until now unknown and rare, respectively, in *Calycolpus*. The best characters for distinguishing *Psidium* and *Calycolpus* are in the seeds, which are still unknown for this species, so some doubt remains, but on consideration of other characters, I believe this species is best placed in *Calycolpus*. It has ovate, persistent bracteoles, which are unknown in *Psidium*, but found in some species of *Calycolpus*. It has bracteate shoot inflorescences with a short axis and leaves that dry dark reddish brown, both of which are common characters in *Calycolpus* and rare in *Psidium*. The prominent brochidodromous venation with the marginal vein closely following the margin is unusual in *Psidium*, but essentially identical to that found in *C. surinamensis*. This is the first species of *Calycolpus* known that has a closed calyx, a character that until now was useful in separating the genera.

1. Calycolpus aequatorialis Landrum, sp. nov. TYPE: Ecuador. Sucumbios: Sendero La Hormiga, 0°5′25″N, 76°12′50″W, 26 Apr. 1986 (fl), *J. Jaramillo 8487* (holotype, QCA, ASU photo; isotypes, NY, QCA, ASU photos). Figure 1.

Haec species *Calycolpo surinamensi* primo aspectu similis, sed calyce ante anthesin clauso, sub anthesi irregulariter fisso, et ramunculis juvenibus 4-alatis differt.

Arbor usque 12-metralis; folia lanceolata, elliptica, vel oblonga, 8.7–18 × 3.6–6.7 cm, 2–3.4 plo longiora quam latiora, apice acuminato, plerumque falcato; stamina ca. 325, ca. 1 cm longa, antherae ca. 3 mm longae, connectivum multi-glanduliferum.

Tree ca. 12 m high, glabrous to minutely puberulent, sometimes densely so on hypanthium and calyx apex within; hairs whitish, to ca. 0.25 mm long, mainly appressed; young twigs with 4 prominent wings (to ca. 1 mm wide), dark reddish brown when dry, glabrous to moderately appressed puberulent. **Leaves** lanceolate, elliptic or oblong, 8.7–18 cm long, 3.6–6.7 cm wide, 2–3.4 times as long as wide, glabrous or nearly so; apex acuminate, usually falcate; base obtuse to acute; petiole 5–6 mm long, 1.5–2 mm wide, channeled, sparsely appressed puberulent; midvein prominent below, impressed above, the venation brochidodromous, with 15 to 20 pairs of lateral veins, these prominent below, impressed above, leaving the midvein at an angle of 60–80°, a clear marginal vein connecting with laterals and ± paralleling the margin, running ca. 2–4 mm within the margin, the tertiary veins connecting the larger veins in a ± dendritic pattern; blades coriaceous, drying dark reddish brown. **Flower buds** pyriform, ca. 18 mm long; peduncles uniflorous, 12–26 mm long, ca. 2 mm wide, terete to somewhat flattened, borne in axillary clusters (short bracteate shoots), obscurely and sparsely puberulent; bracteoles ovate to suborbicular, ca. 3.5 mm long and wide, often wider than long, clasping hypanthium, persisting at least until anthesis; calyx closed in bud, prolonged in an apiculate tip, tearing irregularly at anthesis, sparsely puberulent without

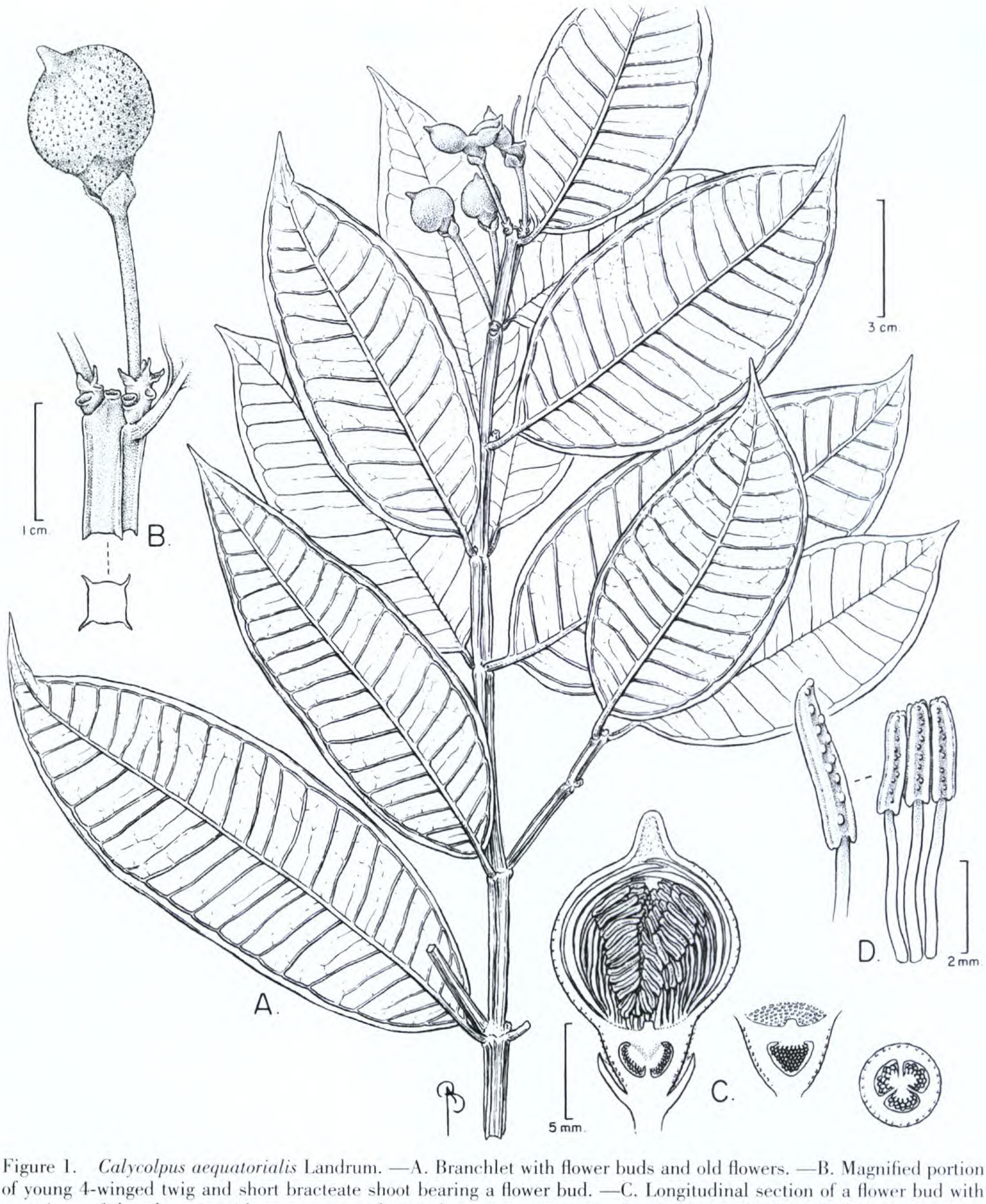

Figure 1. *Calycolpus aequatorialis* Landrum. —A. Branchlet with flower buds and old flowers. —B. Magnified portion of young 4-winged twig and short bracteate shoot bearing a flower bud. —C. Longitudinal section of a flower bud with two views of the placenta with numerous ovules, and a cross section of a floral ovary. —D. Magnified view of anthers showing the glands in the connectives. A–D, *Jaramillo 8487* (QCA).

and within, more densely so near apex within, the remnants ca. 0.2 mm thick when dry; petals glabrous except for a ciliate margin, strongly glandular; hypanthium ca. 8 mm long, densely puberulent; disk subglabrous, ca. 10 mm across; stamens ca. 325, to ca. 1 cm long; anthers oblong, to ca. 3 mm long, with 8 to 22 glands in connective; style ca. 12 mm long, glabrous; ovary 3-locular in 1 flower dissected; ovules ca. 75 in 1 locule observed, ca. 10-seriate, the placenta a nearly sessile, peltate pad. **Fruit** unknown.

This remarkably distinct species is known from a single gathering made by J. Jaramillo, who collected several duplicates, surely realizing that it was something unusual. Habitat information is

lacking from the label, but judging from other collections by Jaramillo from the general vicinity (information available through Tropicos at MO, <http://mobot.mobot.org/W3T/Search/vast.html>), it is a lowland wet tropical forest at about 250 m that is rich in Araceae, Bignoniaceae, Gesneriaceae, Lauraceae, etc. This single collection was flowering in April.

In describing *Calycolpus surinamensis*, McVaugh (1969) drew attention to the strong venation and large persistent bracteoles as being unusual characters in *Calycolpus*, both characters that it shares with *C. aequatorialis*. The lateral veins in these species leave the midvein at an angle of about 60° or more. This type of venation is also found in *C. bolivarensis* Landrum and similar bracteoles are possessed by *C. legrandii* Mattos, species unknown to McVaugh. Closed calyces appear to have evolved numerous times in Myrtaceae, so it is not surprising to find them also in *Calycolpus*. All the specimens known to me are of a single collection and are held at QCA and NY.

Psidium L. (Myrtaceae) is a genus of at least 50 and perhaps as many as 100 species ranging from Mexico and the Caribbean to Argentina and Uruguay. The distinguishing characters of *Psidium* are discussed in Landrum (2003) and in Landrum and Sharp (1989).

2. Psidium huanucoense Landrum, sp. nov. TYPE: Peru. Huánuco: Puerto Inca, Dtto. Yuyapichis, Unidad Modelo de Manejo y Producción Forestal DANTAS, 9°40′S, 75°02′W, 270 m, 16–30 Apr. 1990, *Tello 47* (holotype, USM, ASU photo; isotypes, G, ASU photo, NY, ASU photo). Figure 2.

Haec species *Psidio acutangulo* primo aspectu similis, sed alabastro et fructu pilis erectis densis ochraceis differt.

Arbor usque 15-metralis; ramunculi juvenes 4-alati; folia elliptica-ovalia, ovata vel lanceolata, 8.5–21 × 5.5–9 cm, 1.3–2.5 plo longiora quam latiora; calyx ante anthesin clausus, sub anthesi irregulariter fissus; stamina ca. 600, ca. 12 mm longa, antherae ca. 1.5 mm longae; loculi ca. 265-ovulati.

Tree to ca. 15 m high, sparsely to densely puberulent on most surfaces; hairs light tan to whitish, usually erect, to ca. 0.25 mm long; young twigs with 4 prominent wings, light brown to reddish brown when dry, moderately puberulent, glabrescent with age. **Leaves** elliptic, ovate, or lanceolate, 8.5–21 cm long, 5.5–9 cm wide, 1.3–2.5 times as long as wide, moderately puberulent below (especially along veins), sparsely puberulent to glabrescent above; apex broadly rounded to acute or acuminate (sometimes abruptly so); base cuneate to rounded; petiole 5–12 mm long, 1.5–3 mm wide, channeled, puberulent to glabrescent; midvein prominent below, impressed above, the venation brochidodromous or partially eucamptodromous, with 7 to 10 pairs of lateral veins, these prominent below, impressed to about flat above, leaving midvein at about 45°, a clear marginal vein evident at least distally, arching slightly between laterals, ± equaling laterals in prominence, running 3–12 mm from margin, a second weaker marginal vein running along margin itself sometimes evident, the tertiary veins connecting larger veins in a dendritic (rarely ladder-like) pattern; blades coriaceous, drying dark reddish brown above, olive green below. **Flower buds** pyriform, 15–17 mm long, densely puberulent; peduncles uniflorous or triflorous, 10–22 mm long, to 2.5 mm wide, flattened, the lateral arms of the dichasia to ca. 8 mm long; bracteoles lanceolate-linear, 6–10 mm long, 1–2 mm wide, puberulent, caducous before anthesis; calyx closed in bud, terminating in an acute to acuminate tip, tearing irregularly at anthesis, the remnants 0.5–0.7 mm thick when dry; petals obovate to suborbicular, probably ca. 1.5 cm long when expanded, strongly glandular, densely appressed puberulent centrally without; hypanthium campanulate, about 6–7 mm long; disk ca. 6 mm across; stamens ca. 600, ca. 12 mm long; anthers oblong, ca. 1.5 mm long (perhaps longer when fully expanded), with 5 to 10 glands in the connective; style glabrous, to ca. 1.5 cm long, the stigma peltate; ovary 5-locular in 1 ovary examined; ovules ca. 265 in 1 locule examined. **Fruit** ca. 5 cm diam.; seeds probably more than 200, 4–5 mm long.

Phenology. Flowering in April; fruiting in November.

Habitat and distribution. Based on label data, the habitat is wet tropical forest at ca. 280 m, with ca. 2.5 m of annual precipitation and an average temperature of 23–25°C; so far known from a restricted region of Huánuco, Peru.

Specimens of *Psidium huanucoense* have previously been identified as *P. acutangulum* DC., and it resembles that species except for the velvety indumentum of fine, yellowish, erect hairs, this condition being especially distinct on the flower bud and fruit and quite unlike *P. acutangulum*. The leaves of *P. huanucoense* are generally much larger (8.5–21 × 5.5–9 cm) than in *P. acutangulum* (3.5–13 × 1.5–5.6 cm). The peltate placenta with a broad smooth central area is unlike *P. acutangulum* and more similar to *P. guineense* Swartz. It differs from *P. guineense* in having a

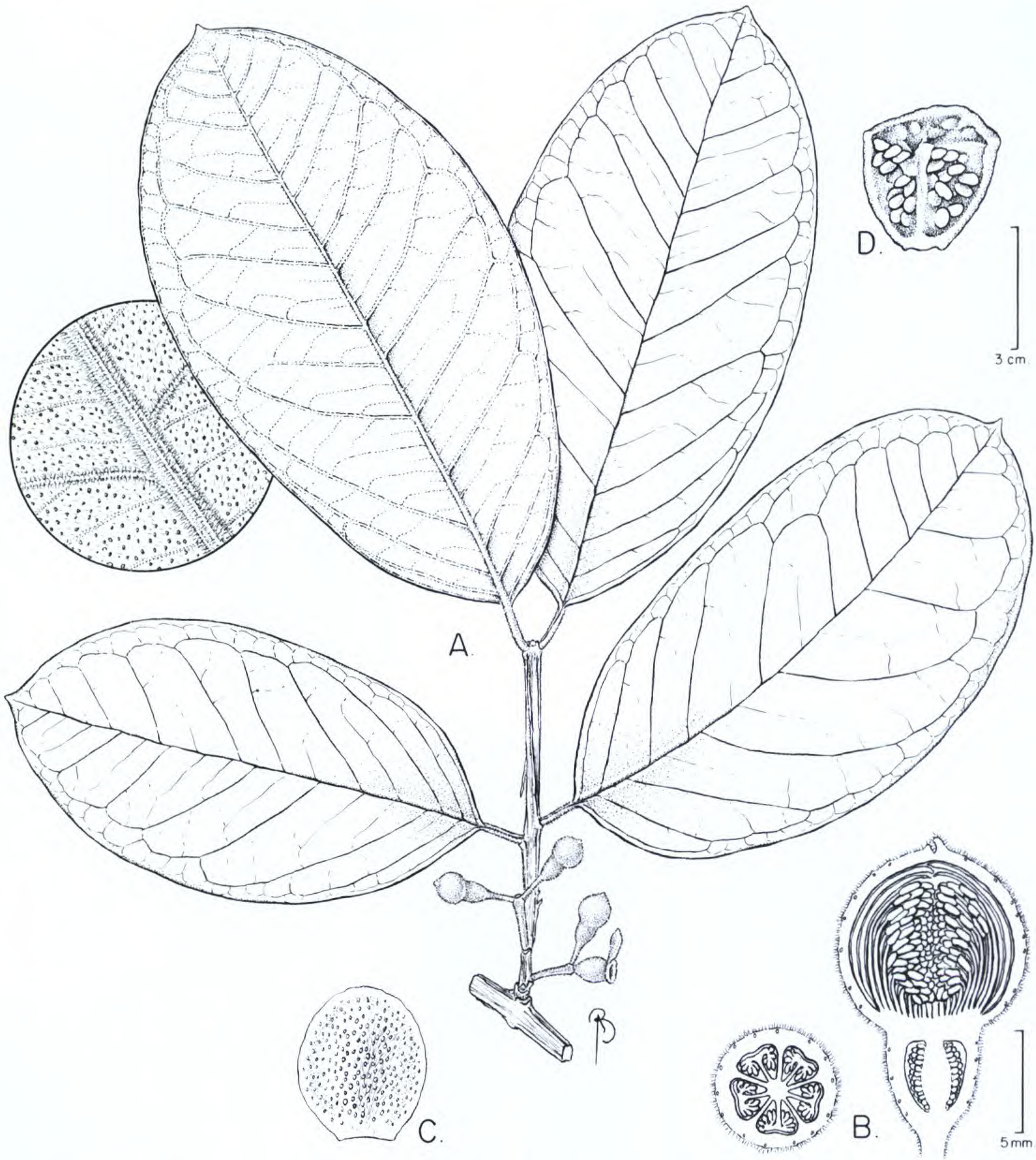

Figure 2. *Psidium huanucoense* Landrum. —A. Branchlet with flower buds and old flower with magnified portion of lower leaf surface. —B. Longitudinal section of a flower bud and cross section of a floral ovary. —C. Detached petal. —D. Portion of a fruit. A–C, *Tello 47* (USM); D, *Kröll Saldaño 684* (ASU).

strong marginal vein. The number of ovules is fewer in *P. guineense* (generally 50 to 100), the anthers usually longer (1–3 mm), and the hairs longer (0.3–0.5 mm). The acute to acuminate tip of the closed calyx of *P. huanucoense* is rare in *P. guineense*.

Paratypes. PERU. **Huánuco:** Puerto Inca, Yuyapichis, Unidad Modelo de Manejo y Producción Forestal DANTAS, 9°40′S, 75°02′W, 270 m, 1–15 Apr. 1991 (bud), *Tello 1756* (G, MO, USM), 1 Nov. 1989 (fr), *B. Kröll Saldaña 684* (ASU).

Acknowledgments. I thank my colleagues J. Jaramillo, K. Romoleroux, B. Leon, and my wife, Sonia Landrum, whose help made this paper possible. I am also grateful to the curators of ASU, G, MO, NY, QCA, and USM, whose collections were fundamental to this study. Three anonymous reviewers

and V. Hollowell offered many helpful suggestions. Figures 1 and 2 were drawn by Bobbi Angell.

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Rubiacearum Americanarum Magna Hama, Pars XVII. A New Species and Four New Combinations in Mesoamerican Rondeletieae (Rubiaceae)

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ABSTRACT. Studies for a forthcoming treatment of Rubiaceae for the *Flora Mesoamericana* project revealed an undescribed species from Honduras and also the necessity for four new combinations in Rondeletieae. The new species *Arachnothryx nelsonii* Lorence is described from Honduras. It is related to the glabrous Mexican species *A. purpurea* (Lorence) Borhidi from which it differs in having leaves sparsely strigillose on the costa, veins, and margins, flowers with a strigillose hypanthium and calyx, white externally strigillose corollas, and subglobose capsules. In addition, the following new combinations are proposed in *Arachnothryx* and *Rogiera*: *Rondeletia myriantha* Standley & Steyermark var. *armentalis* L. O. Williams is elevated to species level as *Arachnothryx armentalis* (L. O. Williams) Lorence; *Rondeletia hondurensis* Donnell Smith is transferred to *Arachnothryx* as *Arachnothryx hondurensis* (Donnell Smith) Lorence; *Rondeletia megalantha* is transferred to *Arachnothryx* as *Arachnothryx megalantha* (Lorence) Lorence; *Rondeletia standleyana* A. R. Molina is transferred to *Rogiera* as *Rogiera standleyana* (A. R. Molina) Lorence; and *Rondeletia ovandensis* Lundell is reduced to synonymy under *Arachnothryx armentalis*.

Key words: *Arachnothryx*, *Javorkaea*, Mesoamerica, *Rogiera*, *Rondeletia*, Rondeletieae, Rubiaceae.

As interpreted in the broad or traditional sense, *Rondeletia* s.l. comprises approximately 230 to 250 species of shrubs and small trees restricted to the tropical regions of Mexico, Central and South America, and the Antilles. However, the genus displays considerable morphological variation and has been split into segregate genera by various authors, most often utilizing morphological characters (for further discussion see Borhidi, 1982, 1987, 2001; Borhidi & Fernandez Zequeira, 1981; and Lorence, 1991). The three principal segregate genera are: *Rondeletia* s. str., comprising ca. 140 species mainly in the Antilles (four species in Mesoamerica); *Arachnothryx* Planchon with ca. 80 species ranging from Mexico to South America; and *Rogiera* Planchon, with 18 species ranging from Mexico to Panama (Mabberley, 1997; Lorence & Taylor, in prep.). Initial cytological evidence based on investigations of two species per genus revealed base numbers of $n = 9$ for *Arachnothryx*, $n = 10, 11$ for *Rogiera*, and $n = 11, 14$ for *Rondeletia* s. str. (Kiehn, 1995).

More recently, Borhidi and collaborators have described several small segregate genera in this alliance in Mexico and Mesoamerica based on morphological criteria, including *Javorkaea* Borhidi & Járai-Komlódi, *Rennistipula* Borhidi, and *Roveanthus* Borhidi (Borhidi & Járai-Komlódi, 1983; Borhidi, 2003, 2004). *Rennistipula* was described to accommodate three species with reniform stipules that Borhidi had previously transferred to *Arachnothryx*: *A. costaricensis* (Standley) Borhidi, *A. galeottii* (Standley) Borhidi, and *A. izabalensis* (Standley & Steyermark) Borhidi. In addition, Borhidi (2004) described *Roveanthus* to accommodate two species he had formerly included in *Rogiera*: *R. strigosus* (Bentham) Borhidi and *R. suffrutescens* (Brandegee) Borhidi. Pending further molecular and phylogenetic studies covering a broad range of Rondeletieae species, I believe it is premature to recognize these new genera and prefer to retain these species in *Arachnothryx* and *Rogiera*, respectively.

Recent molecular-phylogenetic data from *trn*L-F cpDNA gene sequencing suggest that *Rondeletia* s.l. is polyphyletic, and that *Arachnothryx* and *Javorkaea* are closely related to each other and to *Gonzalagunia* Ruiz & Pavón (also Rubiaceae: Rondeletieae), but less closely so to *Rogiera* and *Rondeletia* s. str. (Rova et al., 2002). However, only a small number of species in the *Rondeletia* alliance have been sampled thus far for molecular studies; more importantly, virtually none of the critical species of *Arachnothryx* from Mexico and Central America with unusual floral and seed morphological characters that overlap the generic boundaries proposed by Borhidi and others have been sampled.

These include species such as *Arachnothryx deamii* (Donnell Smith) Borhidi and *A. hondurensis*, whose deviating characters are noted in the key below. Species comprising the segregate genera *Rennistipula* and *Roveanthus* also remain unsampled. Further cytological, morphological, phylogenetic, and molecular studies are clearly needed to satisfactorily resolve the systematics of this complex.

In light of available evidence it was decided to recognize three segregate genera in the broader *Rondeletia* alliance (i.e., *Arachnothryx*, *Rogiera*, and *Rondeletia* s. str.) for the *Flora Mesoamericana* treatment. During the course of preparing accounts of these genera, collections representing an undescribed species from Honduras were encountered. In addition, four new combinations in *Arachnothryx* and one in *Rogiera* are required. A full treatment of the Mesoamerican Rubiaceae will be given in the forthcoming treatment for *Flora Mesoamericana* by David Lorence and Charlotte M. Taylor (Lorence & Taylor, in prep.).

KEY TO THE THREE GENERA IN THE *RONDELETIA* S.L. ALLIANCE IN THE MESOAMERICAN REGION

1a. Lobes of calyx and corolla usually 4 (corolla lobes 5 and calyx lobes 5 to 7 in *A. hondurensis*, calyx lobes rarely 5 or 6 in *A. deamii*); corolla throat glabrous or white papillose-puberulent in and around throat, not yellow or white barbate (except in *A. hondurensis*), lacking a conspicuous fleshy ring around throat, tube internally pubescent in basal portion; capsule dehiscence loculicidal and often with some septicidal splitting; seeds usually rhomboid, square, or triangular, not winged or caudate (except fusiform and winged in *A. deamii*, narrowly winged in *A. costaricensis*, *A. galeottii*, and *A. izabalensis*), the testa usually deeply foveolate-reticulate . . . . . *Arachnothryx*

1b. Lobes of calyx and corolla usually 5 (rarely 4 or 6 in some flowers); corolla densely yellow or white barbate in and around mouth of tube, or with a thickened fleshy ring around mouth of tube, tube glabrous within; capsule dehiscence strictly loculicidal; seeds fusiform, caudate and winged at one or both ends (*Rondeletia*), or angular to rounded or suborbicular (*Rogiera*), the testa usually shallowly foveolate-reticulate.

2a. Corolla with a thickened, fleshy ring around mouth of tube (also papillose or puberulent in *R. belizensis* (Donnell Smith) Lorence); seeds fusiform, caudate and winged at one or both ends (discoid with broad wing in *R. belizensis*) . . . . . *Rondeletia* s. str.

2b. Corolla densely yellow or white barbate in and around mouth of tube; seeds angular and rounded to suborbicular, unwinged . . . . . *Rogiera*

1. Arachnothryx nelsonii Lorence, sp. nov. TYPE: Honduras. Copán: Montaña Los Zapotes, mountain W of Los Zapotes, 18 km N of Copán ruinas on road to Agua Caliente from Copan ruinas and 2–3 km W of Los Zapotes school, 950–1050 m, 14°58′N, 89°10′W, 30 Apr. 1996 (fl, fr), *T. Hawkins 993* (holotype, MO; isotypes, BM, EAP, MEXU, PTBG). Figure 1.

Haec species *Arachnotrychi purpureae* affinis, sed ab ea lamina foliari secus costam venas marginemque parce strigillosa, hypanthio calyceque strigillosis, corolla alba extus strigillosa, atque capsula subglobosa differt.

Small trees 3–8 m tall, the leafy twigs slender, 1–1.8 mm diam., terete, glabrous, drying dark brown, wrinkled, the internodes 0.7–10 cm long. Leaves opposite, those of a pair at a node anisophyllous or subequal, one up to 50% larger than the other; lamina ovate-elliptic, elliptic, oblong-elliptic or oblanceolate-elliptic, 4–11 × 1.5–3.5 cm, the apex abruptly acuminate or caudate, the acumen 1–1.5 cm long, often falcate, the base cuneate to acute, often unequal-sided, drying membranaceous to thinly chartaceous, greenish brown, adaxially sparsely strigillose on costa and secondary veins, abaxially glabrous or sparsely strigillose on costa and veins, the secondary veins 3 to 7 pairs, arcuate, prominulous on both surfaces, eucamptodromous, the axils barbate and domatiate, the venation visible to quaternary order on both surfaces, the margins sparsely strigillose-ciliolate; petioles 2–10 mm long, 0.5–0.8 mm diam., glabrous or adaxially strigillose; stipules broadly to narrowly triangular, acuminate, 0.8–2 mm long, ca. 1 mm wide, externally sparsely strigillose, internally pilosulous. Inflorescence terminal, corymbiform-cymose, trichotomous, 3–7 × 2.5–5 cm (including the corollas), sessile or the peduncle to 3 cm long, 12- to 27-flowered, the primary branches 3, ascending, 0.8–3.4 cm long, subequal or the central one longest, unbranched or branching once again, ending in 2- to 6-flowered cymules, the axes glabrous, flattened, bracteoles 0.8–3 mm long, linear-subulate, strigillose; flowers apparently distylous, subsessile or on pedicels to 1.2 mm long, minutely bracteolate, the hypanthium ellipsoid, 1–1.2 × 0.6–0.8 mm, strigillose, the calyx limb lobed nearly to base, calyx cup 0.3 mm deep, calyx lobes 4, strigillose, unequal, 1 large and oblong or oblong-elliptic, 2–4.5 × 0.7–0.9 mm, the other 3 lobes much smaller, linear or subulate, 1–2.5 × 0.1 mm; corolla salverform, white, the tube ca. 8 mm long, 0.6–0.8 mm diam. medially, externally strigillose with ascending hairs, internally hirtellous in basal 1/3, distally glabrous, the lobes 4, oblong-elliptic, 1.2–1.5 × 1–1.2 mm, externally strigillose-setose, internally glabrous; short-styled flowers with stamens

Figure 1. *Arachnothryx nelsonii* Lorence. —a. Habit with inset showing abaxial leaf surface details. —b. Flower, with hypanthium bearing calyx lobes and style, and corolla tube opened to reveal stamens. —c. Two inflorescence cymules with flowers in bud. —d. Disintegrating capsules showing vascular bundles. —e. Seed. —f. Node with stipule. All drawn from the type, *Hawkins 993*. Scale bar 5 cm in a; 1 cm in b, c, d; 0.5 mm in e; 1 mm in f.

included, sessile, attached ca. 1 mm below apex of tube, the anthers ca. 1 mm long with style glabrous, ca. 3.5 mm long with 2 linear stigma lobes ca. 1.5 mm long; long-styled flowers not seen. Capsules subglobose, 3–4.5 mm diam., glabrate, slightly bisulcate, weakly 6- to 8-ribbed, disintegrating with age to reveal vascular bundles; seeds subglobose-angulate, 0.4–0.6 mm diam., the testa deeply reticulate, dark brown.

Distribution and habitat. Known only from the departments of Copán and Cortés in Honduras where it occurs in montane evergreen wet forest with *Liquidambar*, 950–1500 m in elevation. Collected in flower in February and April, and in fruit in April.

Etymology. This species is named for Honduran botanist Cirilo H. Nelson in recognition of his contributions to the botany of Honduras.

Arachnothryx nelsonii seems most closely related to the nearly glabrous Mexican species *A. purpurea* (Lorence) Borhidi from which it differs in having leaves sparsely strigillose on the costa, veins, and margins, flowers with a strigillose hypanthium and calyx, corolla white with an externally strigillose tube and externally strigillose-setose lobes, and subglobose capsules.

Paratype. HONDURAS. **Cortés:** Montaña de La Nieve, lado SO del Caserío El Tapiquilar, 20 km S de San Antonio de Cortés, 23 Feb. 1982 (fl), *C. Nelson, J. Escobar & R. Andino 8004* (MO 4324692, PTBG, UNAH).

2. Arachnothryx armentalis (L. O. Williams) Lorence, comb. et stat. nov. Basionym: *Rondeletia myriantha* Standley & Steyermark var. *armentalis* L. O. Williams, Phytologia 26: 127. 1973. *Arachnothryx myriantha* (Standley & Steyermark) Borhidi var. *armentalis* (L. O. Williams) Borhidi, Acta Bot. Hung. 35: 310. 1989. TYPE: Guatemala. Quiché: Nebaj, 5600 ft., 22 Nov. 1934, *A. F. Skutch 1776* (holotype, F 815811, photos at MEXU, PTBG).

Rondeletia ovandensis Lundell, Wrightia 5: 326. 1976. Syn. nov. *Arachnothryx ovandensis* (Lundell) Borhidi, Acta Bot. Hung. 35: 310. 1989. TYPE: Mexico. Chiapas: Mt. Ovando near Escuintla, 24 Oct. 1941, *E. Matuda 6067* (holotype, LL, photos at MEXU, PTBG; isotypes, F, LL not seen).

Williams (1973) described *Rondeletia myriantha* Standley & Steyermark var. *armentalis* (meaning "one of a crowd") based on a single flowering specimen. He believed it represented a minor variant of *Arachnothryx myriantha* (Standley & Steyermark) Borhidi, from which it differed in having leaves densely arachnoid-tomentose abaxially and flowers with a sparsely arachnoid-tomentose hypanthium and calyx limb and subequal calyx lobes. Further study of additional collections has revealed that *A. myriantha* is characterized by having leaves that are uniformly arachnoid-tomentose on both surfaces when young and soon glabrescent and its corollas externally strigillose-pilosulous, whereas variety *armentalis* differs in having leaves adaxially persistently hirtellous or scabrid and corollas externally tomentulous on the tube and pilose-setose on the lobes. In view of these fundamentally different pubescent types and to maintain consistency with taxonomic concepts in Mexican and Central American *Arachnothryx*, Williams's variety is here elevated to the species level as *A. armentalis*, the earliest available epithet. Furthermore, *A. ovandensis* is here proposed as a synonym of *A. armentalis*. This species is closely related to *A. buddleioides* (Bentham) Planchon, which differs in having leaves adaxially smooth and glabrous or at first sparsely arachnoid-tomentose and soon glabrescent, inflorescences mostly longer than the subtending leaves, and corolla lobes externally arachnoid-tomentose but lacking pilose-setose trichomes. *Arachnothryx armentalis* occurs in Mexico (Oaxaca, Chiapas) and Guatemala in mesic and cloud forests at 1100–1700 m in elevation.

Representative specimens examined. MEXICO. **Oaxaca:** Sierra Mazateca, Mun. Huautla de Jiménez, alrededores del Puente de Fierro en dirección a Sta. María Chilchotla (7 km de Huautla de Jiménez por la carretera a Teotitlán–Mex 182), *Munn-Estrada & Mendoza 1294* (PTBG). **Chiapas:** from El Triunfo to El Paval, S slopes of Sierra de Soconusco, *Xolocotzi & Sharp X. 489* (MO). GUATEMALA. **San Marcos:** above Finca el Porvenir on "Todos Santos Chiquitos", lower S-facing slopes of Volcan Tajumulco, *Steyermark 37096* (F).

3. Arachnothryx hondurensis (Donnell Smith) Lorence, comb. nov. Basionym: *Rondeletia hondurensis* Donnell Smith, Bot. Gaz. (Crawfordsville) 27: 335. 1899. *Javorkaea hondurensis* (Donnell Smith) Borhidi & J. Komlódi, Acta Bot. Hung. 29: 16. 1983. TYPE: Honduras. Santa Bárbara: Río Chamelecón, 300 m, Dec. 1888, *C. Thieme 5267* (holotype, US 943502; isotypes, F, US [2]).

The segregate genus *Javorkaea* (Borhidi & Járai-Komlódi, 1983) was described to accommodate *Rondeletia hondurensis* Donnell Smith, a species endemic to Honduras and recognized by Standley (1918) as comprising the monospecific but never validly published section Hondurenses Standley of *Rondeletia*. *Javorkaea* was characterized similarly to Standley's Hondurenses by 1- to 3-lobed stipules with well-developed sheaths, 1- to 3-storied inflorescences, a 4- to 7-merous calyx, a large, slightly zygomorphic 5-merous corolla with lobes puberulent basally within, a subcapitate and bilobed stigma, a glabrous nectary disc, 4-colporate pollen, oblong hypanthium and capsule, capsule dehiscence at first loculicidal then septicidal and separating at base, and seeds as in *Arachnothryx* (Borhidi & Járai-Komlódi, 1983). The subcapitate, shortly bilobed stigma and 4-colporate pollen grains are distinctive at the species level but fail to provide sufficient basis for recognition at the generic level (Lorence, 1991).

Subsequently, Borhidi (1997a, 1997b) transferred to *Javorkaea* six Mesoamerican species, two from *Rondeletia* and four that he had previously placed in *Arachnothryx*: *A. chaconii* (Lorence) Borhidi [as *chaconis*], *A. macrocalyx* (Standley & Steyermark) Borhidi, *R. megalantha* Lorence, *R. scabra*

Hemsley, *A. torresii* (Standley) Borhidi, and *A. uxpanapensis* (Lorence & Castillo-Campos) Borhidi. These species all display relatively large white or yellow corollas, puberulent around the mouth of the tube and basally on the lobes within, but are not otherwise closely related to *Arachnothryx hondurensis* except for their large flowers, which may represent an adaptation for moth pollination. Recently, Borhidi (2003) described a new species, *Javorkaea pulcherrima* Borhidi, from Chiapas, Mexico. Based on an examination of the isotype (*Heath & Long 881*, PTBG) this last species name is clearly synonymous with *Arachnothryx jurgensenii* (Hemsley) Borhidi. The addition of these seven species radically changes the original circumscription of *Javorkaea* sensu Standley's section Hondurenses, rendering it a heterogeneous assemblage of large-flowered shrubs or small trees differing in no consistent character or suite of characters from the majority of species otherwise placed in *Arachnothryx*.

The primary characters used to differentiate *Javorkaea*, i.e., the relatively long stipular sheath and calyx cup, 1- to 3-aristate stipules, zygomorphic calyx, large corolla with basally puberulent lobes within, and oblong hypanthium and capsule (Borhidi, 2003), occur in various combinations in other species of *Arachnothryx*, thus representing extremes in a continuum of variation rather than unique discrete character states. For these reasons, *Javorkaea* is here considered as a synonym of *Arachnothryx* and the necessary combination is made below for *R. megalantha*. Borhidi (2004: 101) similarly conceded that it was not possible to maintain *Javorkaea* and transferred *Rondeletia scabra* Hemsley (*Javorkaea scabra* (Hemsley) Borhidi) to *Arachnothryx*.

4. **Arachnothryx megalantha** (Lorence) Lorence, comb. nov. Basionym: *Rondeletia megalantha* Lorence, Novon 4: 132. 1994. *Javorkaea megalantha* (Lorence) Borhidi, Acta Bot. Hung. 40: 16. 1996–1997. TYPE: Honduras. Cuyamel, 23 Aug. 1924, *M. A. Carleton 653* (holotype, US 1208409; isotype, US).

   See the discussion under *Arachnothryx hondurensis*, above.

5. **Rogiera standleyana** (A. R. Molina) Lorence, comb. nov. Basionym: *Rondeletia standleyana* A. R. Molina, Ceiba 1: 262. 1951. *Arachnothryx standleyana* (A. R. Molina) Borhidi, Acta Bot. Hung. 33: 302. 1987. TYPE: Honduras. Morazán, in pine forest above Zambrano, 1200 m, 20 July 1949, *L. O. Williams & A. Molina R. 14417* (holotype, EAP not seen; isotypes, F, US [2]).

Based on its pentamerous flowers and corolla with internally densely yellow-barbate lobes and throat *Rondeletia standleyana* clearly belongs to *Rogiera* (see generic key above), not *Arachnothryx* to which Borhidi (1987) incorrectly assigned it. *Rogiera standleyana* is closely related to *R. nicaraguensis* (Oersted) Borhidi, which differs by its leaves with the lamina adaxially hirtellous-pilosulous and abaxially strigillose and stipules 4–5 mm long, in contrast to being villous on both surfaces and with stipules only 1–3 mm long in *R. standleyana*.

Acknowledgments. Thanks are extended to Anna Stone for skillfully drawing the botanical illustration, Roy Gereau (MO) for kindly supplying the Latin diagnosis, Charlotte Taylor (MO) for constructive comments on the manuscript, and the curators of the herbaria cited herein for access to their collections.

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Estudios en las Apocynaceae Neotropicales XVI: Una Nueva Combinación en *Mandevilla* para Sur América

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Resumen. El estudio de las colecciones tipo de los diferentes taxones del género *Mandevilla* Lindley (Apocynaceae), ha determinado que *Echites speciosum* Kunth, debe ser excluido de la sinonimia de *M. subsagittata* (Ruiz & Pavón) Woodson. Por lo tanto, se establece una nueva combinación, *Mandevilla speciosa* (Apocynaceae, Apocynoideae, Mesechiteae), y *M. fendleri* se reduce a su sinonimia. Adicionalmente, se designa un neotipo para *Mitozus discolor* Miers.

Abstract. The study of the type collections from the different taxa in the genus *Mandevilla* Lindley (Apocynaceae) has established that *Echites speciosum* must be excluded from the synonymy of *M. subsagittata* (Ruiz & Pavón) Woodson. Therefore, a new combination, *Mandevilla speciosa*, is established, and *M. fendleri* is included in synonymy. A neotype is designated for *Mitozus discolor* Miers.

Key words: *Amblyanthera*, Apocynaceae, Apocynoideae, *Echites*, *Mandevilla*, Mesechiteae, Neotropics.

Mandevilla Lindley (Apocynaceae, Apocynoideae), es el género más grande de la tribu *Mesechiteae*, con cerca de 145 especies distribuidas desde México hasta el Norte de Argentina y las Antillas (Morales, datos sin publ.). La última monografía fue hecha por Woodson (1933), quien reconoció 108 taxones, organizados en dos subgéneros y cinco secciones. Sin embargo, este trabajo se desactualizó en forma relativamente rápida por la subsiguiente descripción de varios taxones en las dos décadas posteriores (e.g., Woodson, 1936, 1939, 1948). Durante el proceso de elaboración de una nueva monografía de *Mandevilla*, ha sido necesaria la revisión de la mayoría de los tipos de los nombres hasta ahora publicados, con el fin de reafirmar la validez de las especies aceptadas por la última monografía del género (Woodson, 1933). Trabajos recientes (Morales, 1998; Sales, 1993, tesis sin publ., Univ. Est. Campinas, São Paulo), han aclarado en forma parcial, la numerosa sinonimia prevaleciente dentro del género para algunas regiones geográficas en Mesoamérica y Brasil respectivamente. Como parte de la revisión de especímenes tipo en varios herbarios europeos, fueron revisados la totalidad de las colecciones depositadas en el herbario de Humboldt y Bonpland en París (P-HB). Como resultado, una nueva combinación y nueva sinonimia son establecidas aquí. Los datos de distribución geográfica y altitudinal acá citados fueron tomados de la nueva monografía de *Mandevilla* (Morales, datos sin publ.), por lo que pueden diferir notablemente de los publicados anteriormente por Woodson (1933). Asimismo, las partes de la corola infundibuliformes siguen lo propuesto por Morales y Fuentes (2004a).

Mandevilla speciosa (Kunth) J. F. Morales, comb. nov. Basónimo: *Echites speciosum* Kunth, en HBK, Nov. Gen. Sp. 3: 219. 1818 [1819]. *Exothostemon speciosum* (Kunth) G. Don, Gen. Syst. 4: 82. 1838. TIPO: Venezuela. Datos perdidos (fl, fr), *A. Humboldt s.n.* (holotipo, P-HB, fotografías, INB).

Mandevilla fendleri (Müller Argoviensis) Woodson, Ann. Missouri Bot. Gard. 19(1): 70. 1932. Syn. nov. *Amblyanthera fendleri* Müller Argoviensis, Linnaea 30: 417. 1860. TIPO: Venezuela. Mérida: cerca de Colonia Tovar, 1857 (fl), *A. Fendler 1032* (holotipo, G-DC, fotografía F neg. 26875 en INB y MO; isotipos, BR, F, K [en parte], MO, NY).

Mitozus discolor Miers, Apocyn. S. Amer. 224. 1878. TIPO: Venezuela. Localidad y fecha perdida, (fl), *J. Moritz 1299* (holotipo, BM perdido); Venezuela. Localidad y fecha perdida, (fl), *J. Moritz 1892* (neotipo, seleccionado aquí, BM, fotografía en INB).

Distribución. Colombia, Venezuela, Guyana y el Norte de Brasil, en elevaciones de 800–2250 m.

El basónimo de *Mandevilla speciosa* fue incluido por Woodson (1933, 1936) de manera incorrecta bajo la sinonimia de *M. subsagittata* (Ruiz & Pavón) Woodson, ya que esta última especie se caracteriza por sus corolas estrictamente hipocrateriformes, mientras que *M. speciosa* tiene corolas claramente infundibuliformes, con la parte superior del tubo conspicuamente campanulada. Es impor-

tante aclarar que dentro del subgénero *Exothostemon*, menos de 10 taxones tienen corolas estrictamente hipocrateriformes. En todo caso, basado en los especímenes examinados citados por Woodson (1933), se infiere que él no examinó el tipo de *E. speciosum* y es probable que su propuesta de sinonimizar este taxón fue basada solamente en la descripción del prólogo original.

Ahora bien, el estudio de los especímenes tipo de *Echites speciosum* Kunth y *Mandevilla fendleri* (Müller Argoviensis) Woodson ha determinado que ambas colecciones son similares. Estos taxones pertenecen al subgénero *Exothostemon* (Woodson, 1933), grupo que se caracteriza por sus láminas foliares con coléteres a lo largo del nervio central adaxialmente, así como corolas con el tubo algo giboso basalmente. Las brácteas florales de ambos taxones son escariosas, compartiendo además el mismo tipo (en forma y dimensiones) de corola, siendo prácticamente idénticas en el resto de caracteres morfológicos. Aunque la colección tipo de *M. fendleri* tiene hojas con un indumento más denso en la superficie abaxial en relación al tipo de *E. speciosum*, es importante recordar la alta variabilidad de ese carácter dentro del género *Mandevilla*, lo cual fue comentado en forma previa por Morales y Fuentes (2004b), por lo cual, no se justifica el mantener como separados ambos taxones ni siquiera a nivel de variedad.

Woodson (1933) relegó *Mitozus discolor* Miers y *Mandevilla linearis* N. E. Brown bajo la sinonimia de *M. fendleri*. Sin embargo, de estos dos taxones, únicamente el primero es coespecífico con los tipos de *Echites speciosum* y *M. fendleri*. Miers (1878) describió *Mitozus discolor* y designó a *Moritz 1299* como el tipo. Sin embargo, este espécimen no pudo ser localizado en el herbario de Miers en el Museo Británico (BM), ni tampoco duplicados adicionales pudieron ser localizados en los principales herbarios europeos. El único espécimen anotado por Miers como *Mitozus discolor* lleva el número 1892 y se encuentra depositado en el Museo Británico (BM), siendo concordante con la descripción original dada por él. Este espécimen no difiere de los especímenes tipo de *Echites speciosum* y *M. fendleri*, compartiendo hojas con caracteres similares, tanto morfológicamente como en la presencia y tipo de indumento, así como inflorescencias con brácteas escariosas y corolas infundibuliformes. Ante la pérdida del holotipo y la ausencia de duplicados adicionales, la colección *Moritz 1892* es designada como el neotipo.

Los dos sintipos (*F. McConnell & J. Quelch 132* y *194*) de *Mandevilla linearis* N. E. Br. citados por Brown (1901), representan un taxón con hojas lineares, que no es afín con el concepto de *M. speciosa*. Por su parte, esos sintipos se encuentran relacionados con un complejo de taxones (algunos de ellos aún sin describir) del subgénero *Exothostemon*, que comparten en común hojas lineares. Dado que dicho complejo se encuentra en estudio en este momento, el estatus final de *M. linearis* no será definido por ahora.

Especímenes seleccionados examinados. COLOMBIA. **Antioquia:** Ituango, carretera La Granja–Santa Rita de Ituango, 12 May. 1988 (st), *Zarucchi & Betancur 6472* (HUA, MO, USF). **Boyacá:** Alto Chapón, NO de Bogotá, 3 Jun. 1932 (fl), *Lawrence 143* (F, MO, US). **Cauca:** parque nacional Munchique, El Tambo, vereda La Romelia, 24 Jul. 1993 (fl, fr), *Velayos et al. 7010* (COL, MA). **Cundinamarca:** estación Santana, cerca de Sasaima, Jul. 1945 (fl), *Dugand & Jaramillo 3810* (COL, US). **Huila:** La Argentina, 25 Sep. 1984 (fl, fr), *Lozano et al. 4124* (COL, WIS). **Magdalena:** entre Pueblo Viejo y San Miguel, Jul. 1932 (fl), *Seifriz 369a* (MO, US). **Nariño:** carretera Nariño–Sonsón, 7 Mar. 1987 (fr, fr), *Zarucchi & Bedoya 4542* (COL, HUA, MO, USF). **Quindío:** Armenia, 30 Oct. 1983 (fl), *Arbeláez et al. 228* (HUA, HUQ). **Santander:** entre Pie de Cuesta y Las Vegas, 19–24 Dic. 1926 (fl), *Killip & Smith 16161* (US). **Tolima:** San Agustín, 28 Mar. 1899 (fl), *Sprague 325* (K, US). **Valle:** Cordillera Occidental, Hoya de Albán, 26 Oct. 1946 (fl), *Cuatrecasas 22576* (COL, F, MO, VALLE). VENEZUELA. **Aragua:** entre Guamitas y La Mesa, parque nacional Henry Pittier, 20 May. 1981 (fr), *Rodríguez et al. 1276* (F, MY). **Bolívar:** Gran Sabana, cerca de río Yuruani, 31 Mar. 1988 (fl), *Hernández et al. 4* (M, P, VEN). **Lara:** Morán, carretera Humocaro Alto a Buenos Aires, 19 Jul. 1984 (fl, fr), *Agostini et al. 2805* (MO). GUYANA. Región Potaro-Siaruni, Paramakatoi, 13 Mar. 1989 (fl, fr), *Hahn et al. 5652* (CAY, K, US). BRASIL. **Amazonas:** Surumu, Sep. 1909 (fl), *Ule 8450* (G [2 láminas], K).

Agradecimientos. Quiero agradecer a los curadores de los herbarios BM, BR, F, G, K, MO, NY y P por el envío de material en préstamo, así como por permitirme el uso de sus colecciones. También quiero reconocer la ayuda de Michael Grayum (MO) en la interpretación del código de Nomenclatura Botánica. Se agradece la revisión crítica del manuscrito de Bruce Hansen y un revisor anónimo.

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Alsmithia Subsumed in *Heterospathe* (Arecaceae, Arecoideae)

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Abstract. The palm genus *Alsmithia* H. E. Moore (Arecaceae, Arecoideae), with a single representative from Fiji, is included in synonymy with *Heterospathe* Scheffer as *H. longipes* (H. E. Moore) Norup. The species is distinctive within *Heterospathe* in having an elaborately sculptured endocarp. *Alsmithia* and *Heterospathe* share several characters, most notably the lack of a crownshaft, persistent peduncular bracts and prophyll, a completely encircling prophyll, interfoliar inflorescences, and an elongate peduncle. However, the characters are homoplasious and are only diagnostic in combination. The taxonomic transfer is well supported by molecular phylogenetic studies based on two low-copy nuclear DNA markers, *PRK* and *RPB2*.

Key words: *Alsmithia*, Arecaceae, Areceae, Arecoideae, endocarp sculpture, *Heterospathe*, Indo-Pacific region.

The Fijian *Alsmithia* was described by Moore et al. (1982) with the single species *A. longipes* H. E. Moore. The monotypic genus is defined by the combination of long petioles, a highly extended peduncle, absence of a crownshaft, a completely encircling base of the prophyll at insertion, and an irregularly shaped seed enclosed in a highly sculptured endocarp formed by thick fibers. The completely encircling base of the prophyll is a feature of particular diagnostic importance since it distinguishes *Alsmithia* from *Cyphosperma* H. Wendland, another Fijian genus with which *Alsmithia* might be easily confused.

Heterospathe was erected by Scheffer (1876), and although the taxonomic history of *Heterospathe* is intertwined with several other genera, it is maintained as a distinct genus in the latest formal classification of the palms (Uhl & Dransfield, 1987). In its present circumscription it accommodates 38 species, with species diversity centered in New Guinea, but the genus extends into the western part of the Pacific, particularly the Solomon and Philippine Islands, and the Moluccas (Govaerts & Dransfield, 2005; Uhl & Dransfield, 1987). The following characters define the genus: (1) an interfoliar inflorescence with a prominent peduncle, (2) absence of a crownshaft, (3) typically the presence of a single (two in *H. trispatha* Fernando) prominent and persistent peduncular bract longer than the persistent prophyll (but see also Norup et al., in prep.).

The complex taxonomic history of *Heterospathe* and its perceived lack of noteworthy morphological characters have raised concerns that morphology is not sufficient to resolve relationships within tribe Areceae to which both *Alsmithia* and *Heterospathe* belong. Therefore recent efforts have been concentrated on a molecular systematic approach. By combining data from a number of nuclear DNA markers, it has been possible to obtain well-supported phylogenetic hypotheses for the tribe (Baker & Loo, 2004; Lewis & Doyle, 2002; Norup et al., 2003). The results show that in order for the classification to reflect phylogenetic relationships a number of nomenclatural changes in tribe Areceae are necessary.

The latest molecular systematic study of the Indo-Pacific Areceae members (Norup et al., in prep.) uses two low-copy nuclear loci, intron 4 of the gene encoding the Calvin cycle enzyme phosphoribulokinase (*PRK*) and intron 23 of the gene for RNA-polymerase II, subunit B (*RPB2*). The results obtained from both the analyses of the genes separately and in combination show that *Alsmithia* is embedded within a strongly supported *Heterospathe* (more than 95% bootstrap support; Norup et al., in prep.). Two accessions of *Alsmithia longipes* (*Baker 1180*, FTG; *Zona 1039*, FTG) were sequenced independently to verify the DNA sequences and ensure that this remarkable relationship was not an artifact or a technical error.

The close relationship with *Heterospathe* is surprising because Moore et al. (1982) thought *Alsmithia* to be quite distinct from other members of the *Clinostigma* alliance (named after *Clinostigma* H. Wendland), an informal group erected by Moore (1973). Based on the unusual seed shape and sculpturing of the endocarp, Moore et al. (1982)

suggested a possible relationship with *Burretiokentia* Pichi Sermolli, *Veillonia* H. E. Moore, *Cyphosperma*, and *Physokentia* Beccari, all of which are distributed in the western Pacific region (New Caledonia and Fiji). In their discussion of putative relationships, Moore et al. (1982: 124) particularly noted "a striking habitual resemblance" between *Alsmithia* and *Cyphosperma*, but no reference to *Heterospathe* was made. It is, however, worth noting that when *Alsmithia* was erected in 1982, the easternmost record of *Heterospathe* was in the Solomon Islands (*H. salomonensis* Beccari), and it was not until 15 years later that a new species of *Heterospathe* was described from Fiji as *H. phillipsii* D. Fuller & Dowe, in Fuller et al. (1997). The earliest record of other West Pacific species of *Heterospathe* was made just one year earlier, when *H. uniformis* Dowe was described from Vanuatu (Dowe & Cabalion, 1996).

Both *Alsmithia* and *Heterospathe* show morphological affinities with many of the other Indo-Pacific arecoid genera, thus the molecular data have been essential in pointing to a putative relationship between the two genera. The new well-supported molecular phylogeny makes it possible to evaluate critically the morphology of these two genera (Norup et al., in prep.). *Alsmithia* shares a number of features with *Heterospathe*, notably (1) habit small to moderate, solitary [or sometimes clustering in *Heterospathe*], (2) lack of a crownshaft (leaf sheath splitting to the base), (3) persistent peduncular bracts and prophyll, (4) completely encircling prophyll, (5) interfoliar inflorescences (at least at anthesis), (6) an elongate peduncle, (7) androecium of six stamens (stamens ranging from six to many in *Heterospathe*), (8) awl-shaped filaments, and (9) oblong, dorsifixed anthers that are inflexed in bud (Moore et al., 1982; Uhl & Dransfield, 1987). Most notably, the peduncular bract of *Alsmithia* greatly exceeds the persistent prophyll in length just as in *Heterospathe*, where this is considered a defining character of the genus. Many of the characters mentioned above are shared with a great number of arecoid palms, and *Heterospathe*, including *Alsmithia*, is shown to be distinguished by a combination of homoplasious characters rather than by unique synapomorphies (Norup et al., in prep.).

The striking endocarp sculpturing and seed shape of *Alsmithia* are quite unknown in *Heterospathe* and are undeniably reminiscent of the genera *Burretiokentia*, *Veillonia*, *Cyphosperma*, and *Physokentia*. However, morphological studies have noted some similarity between the pericarp composition in *Alsmithia* and *Heterospathe*, in that they both possess an expanded series of vascular bundles that is uncommon in other closely related genera (Essig et al., 1999). Optimization of ornate endocarps on one of the most recently assembled molecular trees (Norup et al., in prep.) strongly suggests that such endocarps have developed repeatedly within the tribe Areceae. In the present example, the placement of a species (*H. longipes*) with ornate endocarps in a genus with otherwise smooth endocarps is indeed interesting. The sculptured endocarp is probably an ecological adaptation, but until more field observations are available we can only speculate as to the underlying evolutionary driving forces. It would also be valuable to establish through developmental studies if the origin of the endocarp sculpturing is the same in all species that display this particular feature. A second notable character that differs between *Alsmithia* and *Heterospathe* (sensu Uhl & Dransfield, 1987) is the endosperm condition, which is homogenous in the first and ruminate in the latter. The homogenous condition, however, was recently described in *H. uniformis* (Dowe & Cabalion, 1996). Furthermore, variation in endosperm condition, both infrageneric and infraspecific, is known to occur in several palm genera (e.g., Zona, 2003) and is a highly labile condition (Norup et al., in prep.).

Based on the strength of the molecular evidence and the morphological similarities described above, *Alsmithia* is placed in synonymy in favor of a monophyletic *Heterospathe*. Here the necessary new combination is made, which brings the number of species of *Heterospathe* known from Fiji to two.

Heterospathe Scheffer, Ann. Jard. Bot. Buitenzorg 1: 141. 1876. TYPE: *Heterospathe elata* Scheffer.

Alsmithia H. E. Moore, Principes 26: 122. 1982. Syn. nov. TYPE: *Alsmithia longipes* H. E. Moore [= *Heterospathe longipes* (H. E. Moore) Norup].

Barkerwebbia Beccari, Webbia 1: 281. 1905. TYPE: *Barkerwebbia elegans* Beccari [= *Heterospathe elegans* (Beccari) Beccari].

Ptychandra Scheffer, Ann. Jard. Bot. Buitenzorg 1: 140. 1876. TYPE: *Ptychandra glauca* Scheffer [= *Heterospathe glauca* (Scheffer) H. E. Moore].

Heterospathe longipes (H. E. Moore) Norup, comb. nov. Basionym: *Alsmithia longipes* H. E. Moore, Principes 26: 124. 1982. TYPE: Fiji. Taveuni: wet forest on trail along ridge from Wainibau River to mountain crest on E side of Taveuni beyond Lavena village, 325 m, 25 Mar. 1980, *H. E. Moore Jr., R. H. Phillips & S. Vodonaivalu 10545* (holotype, BH; isotype, K).

Specimens examined. FIJI. Collected directly from

wild, origin unknown, cultivated at FTG, *Baker 1180* (FTG); collected directly from wild, origin unknown, cultivated at Floribunda Palms and Exotics nursery, Hawaii, *Zona 1039* (FTG); Taveuni, *H. E. Moore Jr., R. H. Phillips & S. Vodonaivalu 10545* (K).

Acknowledgments. I am most grateful to Jeff Marcus (Floribunda Palms and Exotics nursery, Hawaii) for swiftly providing a specimen of the second *Alsmithia* accession, and to Carl Lewis (FTG) for generating an extra set of sequences to verify the *Alsmithia* sequences produced in Kew. My studies at the Royal Botanic Gardens, Kew, were enabled thanks to economic support from the Oticon Foundation and the Faculty of Science, University of Aarhus. DNA sequencing was, in part, funded by grants from the Royal Society, the Leverhulme Trust, and the British American Tobacco Biodiversity Partnership through the Palms of New Guinea project. Sincere thanks go to Anders Barfod (AAU) for invaluable support, supervision, and critical comments on the manuscript; and to my supervisors at the Royal Botanic Gardens, Kew, John Dransfield and Bill Baker, who introduced me to palms and provided great support and many useful comments. Also thanks to Scott Zona (FTG) and Victoria C. Hollowell (MO) for thorough and constructive reviews of the submitted manuscript.

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Two New Species of *Hypericum* (Clusiaceae) from Korea

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ABSTRACT. Two undescribed species of *Hypericum* (Clusiaceae) have been found during floristic research in Korea. *Hypericum chejuense* S.-J. Park & K.-J. Kim and *H. jeongjocksanense* S.-J. Park & K.-J. Kim are described and illustrated from Cheju Island in southern Korea and Jeongjock Mountain in southeastern Korea, respectively. *Hypericum chejuense* and *H. jeongjocksanense* are easily distinguished from the closely related *H. erectum* Thunberg ex Murray and *H. laxum* (Blume) Koidzumi, respectively, by their habit, petal and sepal size, inflorescence type, style length, stylar hair distribution, leaf base shape, stem branching pattern, sepal size, and DNA sequence from the nuclear ITS regions.

Key words: Clusiaceae, *Hypericum*, Korea.

Hypericum L. is the largest genus of the family Clusiaceae (Guttiferae). The cosmopolitan genus contains about 370 species distributed globally except for arctic and desert areas and the lowland tropics (Mabberley, 1997). Some *Hypericum* species are valuable for ornamentals (e.g., *H. inodorum* Miller) and medicinal uses (e.g., *H. perforatum* L. and *H. androsaemum* L.), and they have become the subjects of extensive investigation (Hennessy et al., 2002; Pepping, 1999). *Hypericum* is classified into 30 sections based on the character combinations of habit, stem shape, glandular trichome type, petal duration, style number, stamen fascicle number, placentation type, and basic chromosome number (Robson, 1977; Robson & Adams, 1981). Twelve species of *Hypericum* belong to three sections and are distributed nearly throughout the Korean peninsula, with these distribution ranges extending into Japan and China. However, the two new species, *H. chejuense* S.-J. Park & K.-J. Kim and *H. jongjocksanense* S.-J. Park & K.-J. Kim, are only known from limited areas in southern Korea. *Hypericum chejuense* and *H. jongjocksanense* are similar to *H. erectum* Thunberg ex Murray and *H. laxum* (Blume) Koidzumi, respectively, both in their morphology and DNA sequence similarity. The new species are easily distinguished by their habit, petal size, inflorescence type, style length, style hair, leaf base shape, stem type and branching pattern, sepal size (cf. Table 1, Figs. 1, 2), and DNA sequences (Park & Kim, 2004).

Hypericum chejuense S.-J. Park & K.-J. Kim, sp. nov. TYPE: Korea. Chejudo Prov.–Cheju Island, Seogwipo Natural Forest, 33°23′N, 126°35′E, 5 Sep. 2000 (fl), *S.-J. Park & K.-J. Kim 20011* (holotype, YNUH; isotype, KUS). Figure 1.

Haec species inter congeneros koreanos ad *Hypericum* sectionem *Hypericum* pertinentes quoad caulem glandulis atratis destitum et capsulam late usque anguste ovoideam ad *Hypericum erectum* maxime accedit, sed ab eo habitu suffruticoso, caule ascendente 10–20 cm alto, foliis basi acutis atque petalis 4.2–5.1 mm longis distinguitur.

Subshrub, 10–20 cm tall, decumbent from rooting base; 5- to 8-branched; stems rounded, eglandular. Leaves sessile; blades narrowly triangular-ovate to narrowly elliptic, 1.52–2.01 × 0.87–1.21 cm; laminar glands black, numerous, small; intramarginal glands black; base acute; margin entire, plane; apex obtuse to rounded; main lateral veins 3- or 4-paired; tertiary veins densely reticulated. Inflorescences 1- to 3-flowered from 1 to 3 nodes, the whole flat-topped to cylindric; bracts and bracteoles reduced, leaf-like, margin entire. Flower ca. 0.7–1.0 cm diam., substellate; buds narrowly ellipsoid, apex acute. Sepals free, erect, ovate-lanceolate, subequal to unequal, ca. 3.2–5.0 × 1.2–1.6 mm; laminar glands black, streaks and dots; intramarginal glands black, sparse or absent; margin entire to irregularly glandular-ciliate, apex obtuse to acute; veins 5; petals bright yellow, obovate to

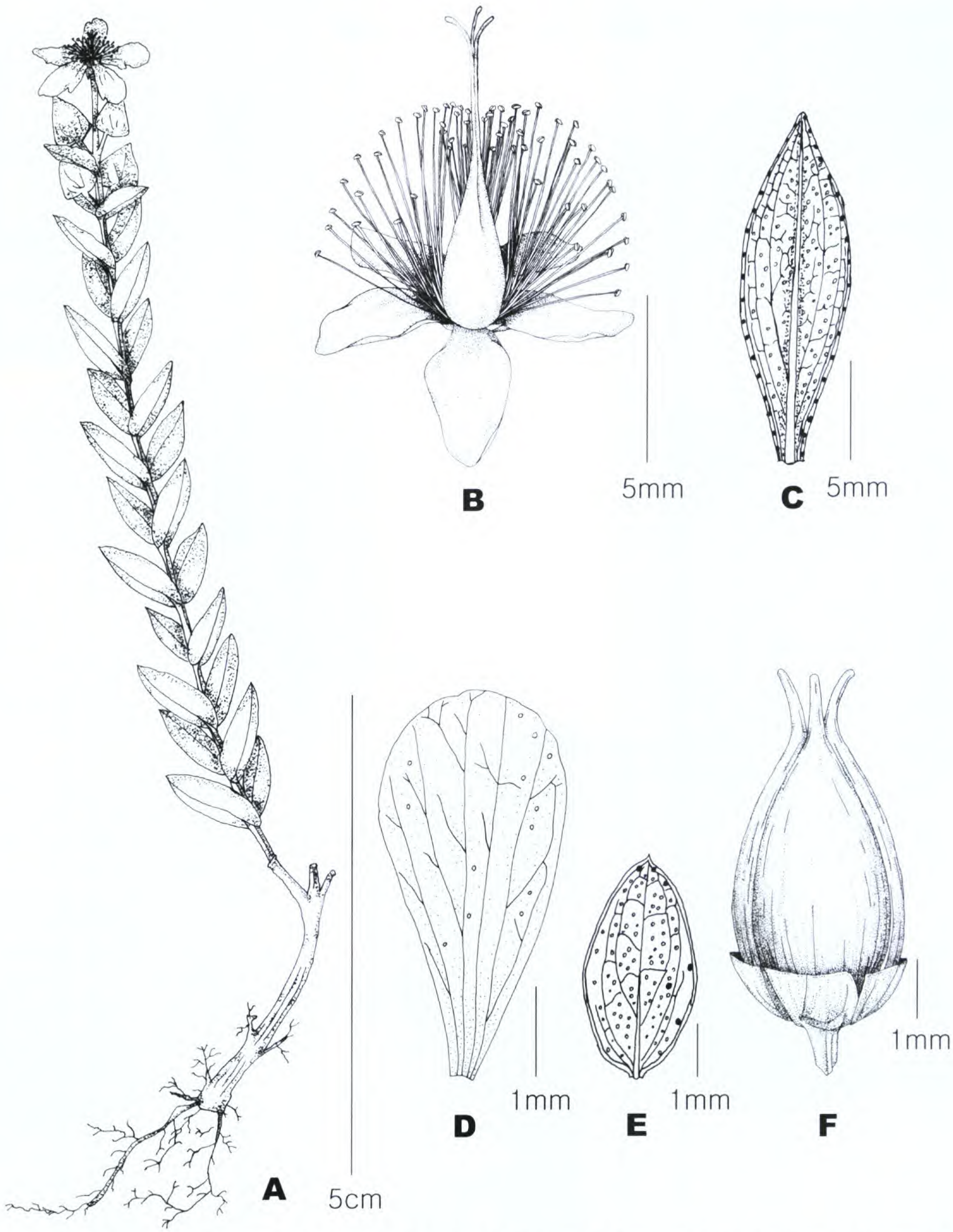

Figure 1. *Hypericum chejuense* S.-J. Park & K.-J. Kim. —A. Habit. —B. Flower. —C. Leaf blade. —D. Petal. —E. Sepal. —F. Fruit. Drawn from the holotype, *S.-J. Park & K.-J. Kim 20011*.

oblong, 4.2–5.1 × 1.2–1.6 mm; margins densely black-punctate, laminar glands black, streaks, distal; marginal glands black, inframarginal to prominent, irregular; margins entire; stamens ca. 2.2–3.5 mm, 3-fascicled. Ovary ovoid; styles 3, 2.5–3.2 mm, widely spreading. Capsule ovoid, ca. 5.2–6.3 × 2.9–3.7 mm; seeds yellow-brown, 0.4–0.6 mm; testa finely reticulate.

Table 1. Comparison of diagnostic characters among the closely related species *Hypericum erectum*, *H. chejuense*, *H. laxum*, and *H. jeongjocksanense*.

Character	*H. erectum*	*H. chejuense*	*H. laxum*	*H. jeongjocksanense*
Habit	herbs	subshrubs	herbs	herbs
Height (cm)	30–70	10–20	7–25	3–5
Petal length (mm)	7.1–15.2	4.2–5.1	4.4–5.2	1.9–3.1
Petal width (mm)	1.8–2.6	1.2–1.6	1.1–1.5	0.5–0.7
Petal color	golden yellow	bright yellow	bright yellow or orange	bright yellow
Inflorescence type	sympodial	sympodial	sympodial	monopodial
Flower number	1 to 3 from apical or axillary nodes	1 to 3 from apical or axillary nodes	1 to 3 from apical or axillary nodes	1 from apical node only
Style length (mm)	3.5–4.0	2.5–3.2	2.1–2.5	1.1–1.5
Stylar hair	absent	absent	absent	present
Leaf base	cordate-amplexicaul	acute	obtuse	obtuse
Leaf veins	4	4	1 to 7	1 to 2
Sepal veins	5	5	3 to 5	3
Stem type	erect	decumbent	erect	erect
Stem branches	1 to 2	5 to 8	1 to 2	1

Habitat and distribution. Open sunny area of subtropical evergreen forests; growing on semi-wet and sand-clay mixed soils. The new species is rare and only known from the type locality of Cheju Island, Korea.

Phenology. Flowering: June to September (pers. obs.); fruiting: July to October.

Hypericum chejuense belongs to section *Hypericum* and appears to be closely related to *H. erectum*. *Hypericum chejuense*, however, can be differentiated easily from *H. erectum* by its subshrubby habit, basally decumbent stems, the usually shorter petal lengths (cf. Table 1) and smaller and broader capsules, more acute leaf bases, and shorter heights. *Hypericum erectum* is widespread through northeastern Asia (Lee, 1979; Li et al., 1990; Ohwi, 1965) and a more variable species assigned to section *Hypericum* subsect. *Erecta* N. Robson (Robson, 2001). *Hypericum chejuense* also belongs to the same subsection as *H. erectum* on the basis of common features.

Etymology. The new species is named for the type locality, Cheju Island of Cheju Province, Korea.

Hypericum jeongjocksanense S.-J. Park & K.-J. Kim, sp. nov. TYPE: Korea. Kyeong-sang-nam-do Prov.: the Upo swamp reserve of Jeong-jock-shan, 550–650 m, 35°27′N, 129°8′E, 27 Aug. 2000 (fl), *S.-J. Park & K-J. Kim 20027* (holotype, YNUH; isotypes, KUS, MO). Figure 2.

Haec species inter congeneros koreanos ad *Hypericum* sectionem *Trigynobrathydem* pertinentes quoad caulem erectum decumbentemve, folia inferiora elliptica ovatave patentia superiora ovata foliacea et sepala apice obtusa ad *Hypericum laxum* maxime accedit, sed ab eo caule simplici 3–5 cm alto, inflorescentiae ramis monopodialibus, petalis 1.9–3.1 mm longis atque stylo 1.1–1.5 mm longo basim versus trichomata gerente distinguitur.

Herbs, annual, 3–5 cm tall, erect; stem solitary, unbranched below inflorescence. Stem 4-lined, with scattered glandular dots. Leaves sessile; blade usually ovate or ovate-trianglar to oblong, 0.22–0.31 × 0.15–0.23 cm; papery, abaxially paler and sometimes glaucous; laminar gland dots dense; intramarginal glands dense; base obtuse, margin plane, apex obtuse; main lateral veins 1 to 2, basal; tertiary reticulation not visible. Inflorescence 1, terminal. Flower 0.15–0.3 cm diam.; bud cylindric-ellipsoid, apex obtuse. Sepals free, erect, narrowly oblong or rarely lanceolate to elliptic, subequal to unequal, 0.7–1.5 × 1.0–1.2 mm; laminar glands lined, distally dots; marginal glands absent; apex obtuse to rounded; veins 3. Petals pale to bright yellow, obovate to oblong, 1.9–3.1 × 0.5–0.7 mm; laminar glands absent; margins entire, eglandular. Stamens 5 to 30, irregular or in 5 obscure groups when few. Ovary broadly ovoid to subglobose; styles 3, 1.1–1.5 mm, spreading; stylar hairs present on the lower portions. Capsule cylindric to globose, 1.1–2.4 × 0.7–1.2 mm, usually slightly shorter or slightly longer than sepals. Seeds straw-yellow, ca. 0.2–0.3 mm; testa finely linear-scalariform.

Habitat and distribution. The new species

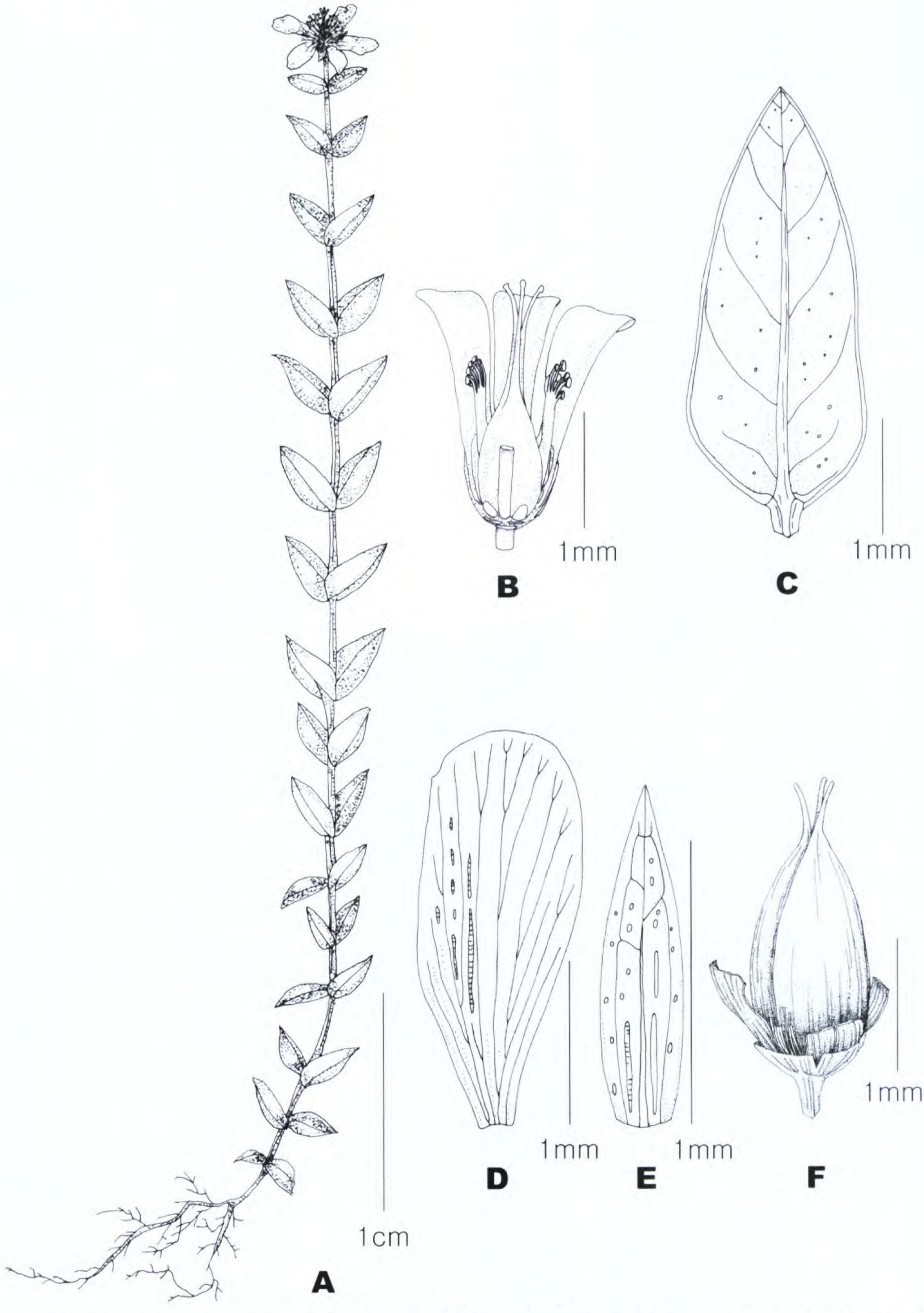

Figure 2. *Hypericum jeongjocksanense* S.-J. Park & K.-J. Kim. —A. Habit. —B. Flower. —C. Leaf blade. —D. Petal. —E. Sepal. —F. Fruit. Drawn from the holotype, *S.-J. Park & K.-J. Kim 20027*.

grows on the wet clay soil of the Mujaechi swamp reserve area of the Jeong-jock-shan of southeastern Korea. The swamp area is maintained by spring water and is a unique ecosystem in Korea. The swamp ecosystem is designated as a protected area by the Ministry of Environment, Korean Government. The new species is rare and endemic to the swamp of Jeon-jock-shan.

Phenology. Flowering: March to September (pers. obs.); fruiting: May to October.

Hypericum jeongjocksanense belongs to section *Trigynobrathys* (Y. Kimura) N. Robson with *H. laxum* and *H. japonicum*. It is closely related to *H. laxum*, differing from it essentially by the monopodial inflorescences. The sizes of the plants, petals, sepals, and seeds are smaller than those of *H. laxum* (Table 1). Also, trichomes exist on the lower portions of the style in *H. jeongjocksanense*. *Hypericum laxum* grows from lowlands to mountains up to 2000 m, and its morphology is variable according to its habitat. *Hypericum jeongjocksanense* has been collected only in the limited lowland swamp areas in Korea.

Etymology. The new species is named for the type locality, Jeong-jock-shan of Kyeong-sang-nam-do Province, Korea.

The distribution of the two new species is limited. *Hypericum chejuense* is distributed on Cheju Island, in southernmost Korea. *Hypericum jeongjocksanense* is distributed in the Upo swamp reserve of the Jeong-jock-shan of southeastern Korea. Both species grow on wet soils. In addition to the external morphology, the nuclear ITS sequence data (Park & Kim, 2004) differentiate the two new species from the closely allied species pairs. The two new species of *Hypericum* from Korea can be distinguished from the known species by the following key.

Key to the Korean Species of *Hypericum*

1a. Styles 5-branched, rarely 4-branched; stamen fascicles 5; dark glands absent on floral parts . . . . . *H. ascyron* L.

1b. Styles 3-branched, rarely 2- or 4-branched; stamen fascicles 3; dark glands usually present on floral parts.

2a. Stems 4-ridged; leaves 0.2–1.0 cm long; annual herbs; flowers 0.15–0.7 cm across; anther apex without black glandular dots; capsules without glands.

3a. Stems erect; lower leaves ovate to broadly ovate, ascending; upper leaves lanceolate to linear, often bract-like; sepals truncate at apex . . . . . *H. japonicum* Thunberg

3b. Stems erect or decumbent; lower leaves elliptic or ovate, spreading; upper leaves ovate, leaf-like; sepals obtuse at apex.

4a. Stems usually branched, 7–25 cm tall; inflorescence branches sympodial; petals 4.4–5.2 mm long; styles 2.1–2.5 mm long, stylar hairs absent . . . *H. laxum* (Blume) Koidzumi

4b. Stems unbranched, 3–5 cm tall; inflorescence branches monopodial; petals 1.9–3.1 mm long; styles 1.1–1.5 mm long, stylar hairs present on the lower portions . . . . . *H. jeongjocksanense* S.-J. Park & K.-J. Kim

2b. Stems terete or with 2 striations; leaves 1.5–5.0 cm long; perennial herbs; flowers 0.7–2.5 cm across; anther apex with black glandular dots; capsules with glands.

5a. Styles shorter than ovary . . . . . *H. oliganthum* Franchet & Savatier

5b. Styles longer than or equal to ovary.

6a. Stems erect, with dark glands; capsules broadly ovoid to narrowly conic . . . . . *H. attenuatum* Choisy

6b. Stems erect to ascending, without dark glands; capsules broadly to narrowly ovoid.

7a. Subshrubs; stems 10–20 cm tall, basally decumbent; petals 4.2–5.1 mm long; leaf bases acute . . . . . *H. chejuense* S.-J. Park & K.-J. Kim

7b. Perennial herbs; stems 30–70 cm tall, erect; petals 7.1–15.2 mm long; leaf bases obtuse . . . . *H. erectum* Thunberg ex Murray

Acknowledgments. The authors thank Roy Gereau for the Latin diagnosis, Victoria Hollowell for critical comments on the manuscript, two anonymous reviewers for the critical readings of the manuscript, and Hae-Lim Lee for the fine illustrations. This work was supported by grants (nos. 052-041-026, 052-052-040) from the Core Environmental Technology Development Project for Next Generation funded by the Ministry of Environment of the Korean Government.

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Notes on Grasses (Poaceae) for the *Flora of China*, IV

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ABSTRACT. The following changes are made in Poaceae, necessary for the upcoming *Flora of China*. *Kengia chinensis* is lectotypified on a specimen of *K. hackelii*, and hence becomes a synonym of the latter. *Kengia gracilis* is synonymized under *K. mucronata*. *Isachne clarkei* is lectotypified. *Isachne beneckei* (also lectotypified) and *I. tenuis* are placed as synonyms of *I. clarkei*. *Isachne albens* var. *hirsuta* is lectotypified and placed as a synonym under *I. sylvestris*. *Isachne semitalis* is lectotypified and placed in synonymy of *I. schmidtii*. The distinctions between the closely related species *I. kunthiana*, *I. schmidtii*, and *I. repens* are discussed. The new species *Arundinella suniana*, from Yunnan province and related to *A. setosa*, is described. *Arundinella setosa* var. *esetosa* is validated. The name *Arundinella hupeiensis* is rejected as a homonym due to its similarity to the name *A. hubeiensis*. *Eccoilopus bambusoides* is transferred to *Spodiopogon*, necessary with the inclusion of *Eccoilopus* within *Spodiopogon*. The new species *Imperata flavida* is described from Hainan, distinguished from *I. cylindrica* mainly by its much shorter spikelet hairs. *Erianthus griffithii* var. *trichophyllus* is transferred to *Saccharum arundinaceum* as *S. arundinaceum* var. *trichophyllum*, as *Erianthus* is included within *Saccharum*. *Polytrias amaura* var. *nana* is transferred to *P. indica*, the correct name for *P. amaura*. *Coelorachis striata* var. *pubescens* is transferred to *Mnesithea*, a necessary transfer when *Coelorachis* is regarded as a synonym of *Mnesithea*. Discussion of the changes is provided throughout.

Key words: *Arundinella*, China, *Cleistogenes*, *Coelorachis*, *Eccoilopus*, *Erianthus*, *Eulalia*, *Imperata*, *Isachne*, *Kengia*, *Mnesithea*, *Polytrias*, *Saccharum*, *Spodiopogon*.

This paper continues the series for Poaceae in *Novon* for the publication of taxonomic novelties and nomenclatural changes that have arisen during the preparation of the grass family account for the *Flora of China*.

ERAGROSTIDEAE

Kengia hackelii (Honda) Packer, Bot. Not. 113: 291. 1960. Basionym: *Diplachne hackelii* Honda, J. Fac. Sci. Univ. Tokyo, Sect. 3, Bot. 3: 112. 1930. *Cleistogenes hackelii* (Honda) Honda, Bot. Mag. (Tokyo) 50: 437. 1936. TYPE: Japan. Musashi Prov., Shirako, 1880, *Matsumura 4* (holotype, TI).

Kengia chinensis (Maximowicz) Packer, Bot. Not. 113: 291. 1960. Basionym: *Diplachne serotina* var. *chinensis* Maximowicz, Bull. Soc. Imp. Naturalistes Moscou 54: 70. 1879. *Cleistogenes chinensis* (Maximowicz) Y. L. Keng, Sinensia 5: 152. 1934. *Cleistogenes serotina* var. *chinensis* (Maximowicz) Handel-Mazzetti, Mazz. Symb. Sinicae 7(5): 1280. 1936. *Cleistogenes hackelii* var. *chinensis* (Maximowicz) Ohwi, Bot. Mag. (Tokyo) 55: 309. 1941. TYPE: Japan. Yokohama, "fine Septembris fl.," *C. Maximowicz* (lectotype, designated here, LE).

When Maximowicz described his variety *chinensis* of *Diplachne serotina* (now *Kengia serotina* (L.) Packer), he based the variety on five syntypes. These comprised three Bretschneider collections from near Peking (Takio-sze, Hei-lung-tau, Wanshou-, China), and two of his own collections, one from Mongolia and the other from Yokohama, Japan. The Japanese collection is a specimen of *Kengia hackelii* (Honda) Packer, the only species of *Kengia* present in Japan.

There has been confusion over the identity of the remaining syntypes, mainly comprising Bretschneider's plants from China. Confusion first resulted from mistakes in the paper by Keng (1934) erecting the genus *Cleistogenes* for a group of Eurasian grasses that had previously been included in *Diplachne*. Keng made the combination *Cleistogenes chinensis* (Maximowicz) Keng based on Maximowicz's variety, but his description, illustration, and

cited specimens all belong to a different species now known as *Kengia songorica* (Roshevitz) Packer. Keng later (1938: 299) realized his mistake and described the specimens he had used in his 1934 paper as *C. mutica* (a synonym of *K. songorica*). However, his combination *Cleistogenes chinensis* remains validly published.

In 1934 Keng had cited several specimens from China under *Cleistogenes serotina*. Two years later Handel-Mazzetti (1936) transferred Maximowicz's variety to *C. serotina* as *C. serotina* var. *chinensis*. These are the basis for reports of the distribution of *Kengia serotina* extending to China (e.g., Kit Tan, 1985: 579). Typical *K. serotina* occurs from southern and eastern Europe only as far east as western Turkmenistan and is not known from eastern Russia or China (Tsvelev, 1983: 949). Ohwi (1941: 309) recognized that the eastern Asian populations differ from European *Kengia serotina* and assigned both the Chinese and Japanese elements of *Diplachne serotina* var. *chinensis* to *Cleistogenes hackelii*, separating the Chinese plants as *C. hackelii* var. *chinensis*.

In recent Chinese literature *Kengia chinensis* has been recognized as a separate species distinct from *Kengia hackelii* (C. P. Wang, 1990: 47). Conert (1959: 232) put forward the suggestion that the Chinese element of *Diplachne serotina* var. *chinensis* (1879), based on Bretschneider's collections, may be conspecific with *Kengia kitagawae* (Honda) Packer (1936: 99).

Clearly a lectotypification is necessary to fix the use of the name *Diplachne serotina* var. *chinensis* and hence *Kengia chinensis*. A search was undertaken in the St. Petersburg herbarium (LE) to locate the original syntypes. Three Bretschneider specimens were found from the type localities near Peking, but labeled with the manuscript name "*Diplachne rigidula* n sp." in Maximowicz's hand. One is *Kengia kitagawae*, and the other a mixed collection. No specimen from Mongolia was located. However, there is a specimen collected by Maximowicz in Yokohama, and clearly labeled by him as *Diplachne serotina* var. *chinensis*. This is selected here as the lectotype. Hence *C. chinensis* becomes a synonym of *K. hackelii*, and the current use of the later name *K. kitagawae* for the Chinese taxon is preserved.

Kengia mucronata (Y. L. Keng ex P. C. Keng & L. Liou) Packer, Bot. Not. 113: 293. 1960. *Cleistogenes mucronata* Y. L. Keng ex P. C. Keng & L. Liou, Acta Bot. Sin. 9: 70. 1960. TYPE: China. Gansu: without locality or date, *T. P. Wang s.n.* (holotype, NAS).

Kengia gracilis (Y. L. Keng ex P. C. Keng & L. Liou) Packer, Bot. Not. 113: 293. 1960. *Cleistogenes gracilis* Y. L. Keng ex P. C. Keng & L. Liou, Acta Bot. Sin. 9: 69. 1960. Syn. nov. TYPE: China. Shaanxi: Wu-kung, Chang-kia-kang, 1940, *K. S. Tien s.n.* (holotype, NAS).

Additional specimens. CHINA. **Shanxi:** Sihsien, 7 Sep. 1935, *T. P. Wang 3568* (K). **Shaanxi:** Si Kuan ts'. . .(illegible), 16 Oct. 1916, *E. Licent 3020* (K).

Kengia mucronata and *K. gracilis* were described at the same time in 1960. Y. C. Keng distinguished them only by the number of florets in the spikelet (4 to 6 in *K. mucronata*; 5 to 8 in *K. gracilis*), and by the number of veins in the upper glume (often 3 in *K. mucronata*; 1 in *K. gracilis*). Two other specimens at Kew have 3 to 5 florets and 1-veined glumes.

The glumes in all *Kengia* species are variable. The cleistogamous spikelets found in the upper leaf sheaths generally have fewer florets and smaller hyaline glumes than the chasmogamous spikelets of the terminal panicle. The lower spikelets of the terminal panicle tend to have smaller, fewer-veined glumes than those above. When the glumes are predominantly 1-veined, small lateral veins can usually be found in some spikelets, sometimes only on one side of the glume. Hence glume nervation is a very unreliable character for distinguishing species in *Kengia*. When the spikelets have a larger number of florets, the spikelets overlap, giving the panicle branches a denser appearance.

Kengia mucronata can be characterized as follows: habit densely tufted, wiry, with basal clumps of old sheaths, lacking basal scaly buds; leaf blades numerous, stiff, patent, inrolled, uppermost blades very short; panicle exserted from uppermost leaf sheath, open; spikelets with inconspicuously mucronate lemmas.

Kengia mucronata is selected here to have priority over *K. gracilis* because the type specimen is better. The type of *K. gracilis* lacks a base.

ISACHNEAE

Isachne clarkei Hooker f., Fl. Brit. India 7: 24. 1897 [1896]. TYPE: NE India. Kohima, 1520 m, "5000 ft" [1520 m], 20 Oct. 1885, *C. B. Clarke s.n.* (lectotype, designated here, K).

Isachne beneckei Hackel, Oesterr. Bot. Z. 51: 459. 1901. Syn. nov. TYPE: Indonesia. Java, Prigen, 23 Mar. 1891, *F. F. Benecke 22* (lectotype, designated here, W).

Isachne tenuis Y. L. Keng ex P. C. Keng, Acta Phytotax. Sin. 10: 15. 1965. TYPE: China. Yunnan: Ping-bien Hsien, Shi-tuen, 29 Sep. 1939, *C. W. Wang 82192* (type, PE [at NAS, 2004]).

This is a delicate annual species with narrowly lanceolate leaf blades, and an open panicle of small (1–1.5 mm) scattered spikelets on slender glandular pedicels. The specimen selected as the lectotype for *Isachne clarkei* is one of two sheets at Kew collected by Clarke at Kohima in the Naga Hills, and bears the name "clarkei" on the label in Hooker's handwriting. The syntype specimens from Sikkim included by Hooker in the protologue are *I. sikkimensis* Bor, a species with longer (2–2.4 mm) elliptic spikelets and an eglandular panicle.

When Hackel described *I. beneckei* he compared it with the protologue of *I. clarkei* and apparently had difficulty finding real differences, mentioning little more than the thin texture of the leaf blades of *I. clarkei.* In fact, the type specimens of the two taxa agree very well. Hackel based his species on two syntype specimens from Java, *Benecke 22* and *30.* The better specimen, *Benecke 22,* is selected here as the lectotype.

Isachne tenuis was first established by Y. L. Keng (1957: 117, 218) and described by him two years later (1959: 642, t. 580), but both these publications lack a Latin diagnosis. In the 1965 protologue *I. tenuis* is said to differ from *I. beneckei* by its smaller spikelets, fewer-nerved glumes, and glandular pedicels. However, the type of *I. beneckei* does also have glandular pedicels, and the other characters fall within the normal range for *I. clarkei.*

Isachne sylvestris Ridley, J. Straits Branch Roy. Asiat. Soc. 44: 206. 1905. *Isachne albens* var. *sylvestris* (Ridley) Jansen, Reinwardtia 2: 280. 1953. TYPE: Malaysia. Perak, Telok Sera, 17 Mar. 1896, *H. N. Ridley 7265* (holotype, K).

Isachne albens var. *hirsuta* Hooker f., Fl. Brit. India 7: 23. 1897 [1896]. Syn. nov. *Isachne hirsuta* (Hooker f.) P. C. Keng, Acta Phytotax. Sin. 10: 11. 1965. TYPE: NE India. Cachar, *R. L. Keenan* (lectotype, designated here, K).

This is one of the more vigorous species of *Isachne,* with culms up to 65 cm tall and a much-branched panicle about 20 cm long. It is similar to the widespread southeast Asian species *I. albens* Trinius and was first described from northeastern India as a variety of this. However, it is clearly specifically distinct, as set out in the following key couplet.

KEY TO DISTINGUISH *ISACHNE ALBENS* AND *I. SYLVESTRIS*

1a. Leaf sheaths glabrous; leaf blades 0.8–1.8 cm wide; culm nodes and panicle eglandular; spikelets 1–1.5 mm, whitish green . . . . . *I. albens*

1b. Leaf sheaths densely hirsute; leaf blades 1.3–2.4 cm wide; culm nodes and panicle branches glandular; spikelets 1.3–1.9 mm, green or purplish green . . . . . *I. sylvestris*

A separate specific status for *Isachne albens* var. *hirsuta* was recognized by P. C. Keng, who raised it to specific rank as *I. hirsuta.* However, this grass had already been described at specific rank as *I. sylvestris* by Ridley, based on a specimen from the Malay peninsula. The types of both are at Kew, and are clearly conspecific.

Isachne albens var. *hirsuta* was described by J. D. Hooker based on two syntype specimens from northeast India (Silhet, *de Silva in Wall. Cat. 8657* and Cachar, *Keenan s.n.*). The more complete collection from Cachar collected by Keenan is selected here as the lectotype. The other cited collection, from Silhet by De Silva, consists only of the top of a culm with one leaf and a panicle.

THE CIRCUMSCRIPTION OF *ISACHNE KUNTHIANA* (WIGHT & ARNOTT EX STEUDEL) MIQUEL, *I. SCHMIDTII* HACKEL, AND *I. REPENS* KENG

This group of three species has been much confused in the literature. They are low-growing species with lanceolate leaf blades, eglandular panicles, spikelets over 2 mm long, and similar florets. The differences between them are set out here in order to clear up the confusion.

The oldest name is *Isachne kunthiana,* originally described from India by Steudel as *Panicum kunthianum.* This grass is apparently confined to India and Sri Lanka and has spikelets with the glumes clearly longer than the florets. The confusion arose when Miquel transferred the name from *Panicum* to *Isachne,* while misapplying it to a similar species in southeast Asia with long glumes. Since then *I. kunthiana* has been widely described as occurring in southeast Asia (e.g., Gilliland, 1971; Davidse, 1994; Lazarides, 1980; Iskandar & Veldkamp, 2004). The correct name for this southeast Asian species is *I. schmidtii.*

In 1899 Hackel (1899: 721) assigned a grass from the Ryukyu islands (Japan) to a new variety *nudiglumis* of *Isachne myosotis.* Later Koyama (1962) correctly recognized its affinity to the southeast Asian species known as *I. kunthiana* and transferred it as *I. kunthiana* var. *nudiglumis,* hence compounding the misapplication of the species name *I. kunthiana.* Meanwhile Y. L. Keng (1933: 129) had described this grass at the species level as *I. repens,* based on specimens from southern mainland China. Koyama knew this, and cited *I. repens* as a synonym of *I. kunthiana* var. *nudiglumis.*

Brief descriptions follow, setting out the most important differences, with relevant synonymy. A key to distinguish these three taxa is given below.

KEY TO DISTINGUISH *ISACHNE KUNTHIANA*, *I. SCHMIDTII*, AND *I. REPENS*

1a. Plant with underground rhizomes; leaf blade base cordate; glumes with a few long setae or glabrous, longer than florets . . . . . *I. kunthiana*
1b. Plant with surface stolons; leaf blade base obtuse to rounded; glumes densely scabrid-hispidulous, longer than or equaling florets.
  2a. Glumes longer than florets; leaf blades 2.6–4.5 cm; panicle contracted, 0.5–1 cm wide, branches erect . . . . . *I. schmidtii*
  2b. Glumes equaling florets; leaf blades 5–7.5 cm; panicle open, 1.4–2.8 cm wide, branches ascending or spreading . . . . . *I. repens*

Isachne kunthiana (Wight & Arnold ex Steudel) Miquel, Fl. Ned. Ind. 3: 460. 1857. *Panicum kunthianum* Wight & Arnold ex Steudel, Syn. Pl. Glumac. 1: 96. 1854. TYPE: India. "Penins. Ind. or.," *Herb. Wight 1659* (isotype, K).

Plant with underground rhizomes. Leaf blades 1–11 cm, hispid, base cordate, basal margins pectinate. Panicle contracted to open, branches appressed to widely spreading, scabrid, pilose at least in the axils. Glumes chartaceous, longer than florets, contracted above florets, acuminate-cuspidate, with a few long tubercle-based setae or glabrous; florets elliptic, the upper slightly shorter, more convex and often pubescent.

Miquel transferred the epithet *kunthiana* to *Isachne* in 1857, on the basis of a specimen from Java that had been tentatively placed under *Panicum kunthianum* by Steudel. J. D. Hooker (1896: 21) cited a Ridley collection from Singapore that is a syntype of *I. semitalis* (syn. of *I. schmidtii*). Jansen (1953: 285) placed *I. schmidtii* in synonymy under *I. kunthiana*, but he does not appear to have examined specimens from India.

In fact, although *I. kunthiana* and *I. schmidtii* are similar in facies and in possessing long glumes, they are clearly distinguishable by the characters given here in the key and descriptions.

Isachne schmidtii Hackel, Bot. Tidsskr. 24: 97. 1901. TYPE: Thailand. Koh Chang island, *J. Schmidt s.n.* (holotype,W).

Isachne semitalis Ridley, Fl. Malay. Penin. 5: 237. 1925. TYPE: Malaysia. Selangor, Rantau Panjang, *C. B. Kloss 78* (lectotype, designated here, K).

Plant with surface stolons. Leaf blades 2.6–4.5 cm, glabrous or with thinly scattered hairs, base obtuse to rounded, margins not pectinate. Panicle contracted, 0.5–1 cm wide, branches erect, almost smooth, slightly scaberulous, glabrous or with occasional scattered setae. Glumes herbaceous, longer than florets, evenly narrowing above florets, densely scabrid-hispidulous; florets ovate to subrotund, monomorphic, slightly glossy, pubescent only on inrolled margins.

Ridley cited five syntype specimens in the protologue of *Isachne semitalis*. All are in the Kew herbarium and are a good match with the type of *I. schmidtii*. The best example is selected here as lectotype.

Glume length is variable in this species. The glumes typically exceed the florets by 0.5–1 mm. However, some spikelets may have glumes scarcely longer than the florets in panicles where most spikelets have clearly longer glumes. Possibly *I. repens* may better placed as a subspecies under *I. schmidtii*, as done by Koyama (1962, 1987 as *I. kunthiana* subsp. *nudiglumis*), but we do not wish to do this here as we have seen insufficient specimens to be certain.

Isachne repens Y. L. Keng, Sunyatsenia 1: 129. t. 33. 1933. TYPE: China. Guangdong: Ting Wu Shan, 18 Oct. 1929, *C. L. Tso 21292* (holotype, IBSC).

Isachne myosotis var. *nudiglumis* Hackel, Bull. Herb. Boiss. 7: 721. 1899. *Isachne firmula* Buse var. *nudiglumis* (Hackel) Rendle, J. Linn. Soc. Bot. 36: 322. 1904. *Isachne kunthiana* var. *nudiglumis* (Hackel) Koyama, J. Jap. Bot. 37: 236. 1962. *Isachne kunthiana* subsp. *nudiglumis* (Hackel) Koyama, Grass. Jap. Neighb. Reg.: 511. 1987. TYPE: Japan. Ryukyu Is., Liu-kiu I., Mt. Yonahadake, *Tashiro ex collect. Matsumura s.n.* (holotype, W).

Plant with surface stolons. Leaf blades 5–7.5 cm, glabrous or pilose, base obtuse to rounded, margins not pectinate-hispidulous. Panicle open, 1.4–2.8 cm wide, branches ascending or spreading, smooth, glabrous. Glumes herbaceous, equal to florets or upper very slightly shorter, densely scabrid; florets ovate to subrotund, monomorphic, slightly glossy, pubescent only on inrolled margins.

Isachne repens is a slightly larger grass than *I. schmidtii*, with bigger leaf blades and a less contracted panicle. However, the spikelets are similar except for the shorter glumes.

The taxon is incorrectly named as *I. kunthiana* in the recently published *Flora of Taiwan* (Hsu, 2000: 449), where *I. schmidtii* is cited in synonymy. The text therein refers to the glumes exceeding the florets, but the accompanying illustration clearly

shows them subequal and is a good representation of *I. repens*.

For distribution within China, see Chen (1990: 178).

ARUNDINELLEAE

Arundinella suniana S. M. Phillips & S. L. Chen, sp. nov. TYPE: China. Yunnan: "reg. bor., Yunnanfu," 19 Sep. 1922, *J. Cavalerie s.n.* (holotype, BM).

Haec species *Arundinellae setosae* affinis, sed nodis barbatis, inflorescentia contracta, ramis spiculis congestis, spiculis longioribus (6.8–7.8 mm non 5–6.5 mm), lemmate inferiore spicula aequilongo, lemmate superiore bilobato, lobis triangularibus setosis differt.

Base absent; culm ca. 85 cm tall, 3 mm diam., 3-noded, nodes lanate. Leaf sheaths smooth, upper margin and mouth villous, otherwise glabrous; ligule ca. 0.5 mm, membranous, ciliolate; leaf blades narrowly linear, ca. 22 × 2.5–3.5 mm, glabrous, scabrous, apex finely acuminate. Panicle lanceolate, contracted, ca. 10 × 2.5 cm, branches densely spiculate, lowest branch ca. 3.5 cm; main axis and branches scabrous puberulous on edges; pedicels very unequal, the longer 2.5–3 mm, the shorter 0.5–1 mm, not setose at apex. Spikelets 6.8–7.8 mm, dark gray; glumes lanceolate, conspicuously setose on veins with stiff tubercle-based trichomes, apex acuminate-caudate; lower glume ca. 6 mm, 3-veined, upper glume ca. 7.3 mm, 5-veined; lower floret staminate or sterile, ca. 6.5 mm, equaling upper glume, lemma smooth, glabrous, 3-veined; upper floret bisexual, elliptic-oblong, ca. 3.8 mm, apex clearly 2-dentate, shortly pilose on upper flanks and apical lobes, awned from sinus, lobes triangular, each tipped by 0.7–0.9 mm awnlet; awn geniculate, column ca. 2 mm, limb 4–4.3 mm; anthers 3, 2.5–2.7 mm. Caryopsis not seen.

This species is named after B. S. Sun, the eminent agrostologist from Yunnan province, and is at present known only from the type. It is clearly related to the widespread and variable *Arundinella setosa* Trinius by the possession of lateral bristles on the upper lemma, but differs by the combination of characters set out in the diagnosis above. The contracted panicle of dark-colored, setose spikelets is particularly noteworthy and reminiscent of that found in *Arundinella hookeri*. However, that species has broader (up to 1.2 cm), densely villous leaf blades, and an emarginate upper lemma lacking lateral bristles.

In *Arundinella setosa* the lower floret is shorter than the glumes, or at least clearly shorter than the upper glume, and the upper lemma is scabrous, the lateral bristles arising more or less directly from the awn base. In contrast, in *Arundinella suniana* the lower floret is as long as the upper glume, and the lateral bristles arise from definite membranous apical lobes.

Arundinella setosa Trinius var. **esetosa** Bor ex S. M. Phillips & S. L. Chen, var. nov. TYPE: India. "Hab. Himal. Bor. Occ., regio trop.," 31 Aug. 1849, *T. Thomson s.n.* (holotype, K).

Bor (1960: 425) provided a Latin description when establishing this variety and cited three specimens (*T. Thomson s.n.*; *Stainton, Sykes & Williams 4255, 4461*). However, he neglected to indicate a type, a necessary requirement of valid publication after 1958. The *Thomson* specimen is selected here as type because it clearly shows the setose pedicels of *A. setosa*, and also lacks any trace of apical lateral bristles on the upper lemma, the defining character for this variety.

NOTE ON *ARUNDINELLA HUPEIENSIS* KENG & X. P. LIOU, FL. HUBEIENSIS 4: 312. 2001.

The species epithet "*hupeiensis*" is confusingly similar to the epithet "*hubeiensis*," already in use in *Arundinella* for the previously published *A. hubeiensis* D. M. Chen (1983). Both are named after the Chinese province of Hubei. According to Article 53.3 of the *International Code of Botanical Nomenclature* (Greuter et al., 2000) such names are to be treated as homonyms, and are therefore illegitimate. *Arundinella hupeiensis* is based on the collection *L. Y. Tai & C. H. Chien 465*, stated to be in the herbarium of Nanjing University. However, it could not be found there on enquiry by the second author. It seems likely that it is a specimen of *Arundinella setosa* var. *esetosa*.

ANDROPOGONEAE

Spodiopogon bambusoides (P. C. Keng) S. M. Phillips & S. L. Chen, comb. nov. Basionym: *Eccoilopus bambusoides* P. C. Keng, in B. J. Geng & G. Q. Song, Guihaia 13: 320. 1993. TYPE: China. Guangxi: Guilin, Qixingyan, 27 Oct. 1953, *Guangxi Expedition 3820* (holotype, PE [PB in error, 1993], not seen).

This species was originally published as *Spodiopogon bambusoides* by Y. L. Keng (1957: 139, 235) with a brief Chinese description as part of a key, but without a Latin diagnosis. Two years later he provided a full description (1959: 768), but again only in Chinese. The name was therefore not validly published. His son P. C. Keng later provid-

ed the necessary Latin description and type information, but placed it in the genus *Eccoilopus*, as noted above.

The genus *Eccoilopus* Steudel comprises a small group of species in Asia distinguished from *Spodiopogon* s. str. by a tough raceme rachis (articulations are present but do not actually fracture), with both spikelets of a pair pedicellate, rather than one sessile and the other pedicelled. The genus *Eccoilopus* will be included within *Spodiopogon* in the upcoming treatment for Poaceae in *Flora of China*.

Imperata flavida Y. L. Keng ex S. M. Phillips & S. L. Chen, sp. nov. TYPE: China. Hainan: Ton Fao Kacheh river, sandy river shore, 91 m ["300 ft"], 14 Jan. 1923, *Eryl Smith s.n.* (holotype, K).

Haec species *Imperatae cylindricae* affinis sed pilis calli spicula aequilonga non 3-plo longiore, stigmatibus flavido-brunneis non atropurpureis differt.

Rhizomatous perennial; rhizomes spreading, woody, internodes closely packed, 3–5 mm; old leaf sheaths fibrous; culms solitary, erect, 70–125 cm tall, 3–7 mm diam.; nodes glabrous. Leaf sheaths crowded near base, longer than internodes, smooth, glabrous except for silky trichomes at mouth, uppermost sheath spathelike with vestigial blade and enclosing base of panicle; ligule ca. 1 mm, brown, margin densely ciliolate; leaf blades linear, flat, 20–60 × 0.5–1.0 cm (upper culm blades much shorter), smooth, glabrous, base narrowed to prominent midrib, apex acuminate. Panicle cylindrical, 12–17 × 2.5 cm; branches short, erect; pedicels of a pair unequal, long-pilose, expanded upward. Spikelets narrowly elliptic oblong, 3–4 mm, membranous; callus trichomes equal to spikelet or slightly shorter; glumes pilose on back in lower third, trichomes equaling spikelet, lower glume 5-veined, upper glume 7-veined, upper margins ciliate, apex obtuse or erose; lower lemma broadly oblong, ca. 2 mm, ciliate, irregularly denticulate; upper lemma and palea ca. 1.5 mm, ciliate, irregularly lobed; anthers 2, 2.5–2.8 mm; stigmas yellowish brown. Caryopsis not seen.

Distribution. China, Hainan island, in mixed forest along rivers and in valley bottoms (L. Liu, 1997: 35).

This species was originally published by Y. L. Keng (1957: 138, 234) with a brief Chinese description as part of a key, but without a Latin diagnosis. Two years later he provided a full description with an illustration (1959: 756, fig. 701) based on the specimen *McClure 7791*, but again only in Chinese. The name was therefore not validly published. L. Liu (1997: 35) included the species under *Imperata*, with the reference "Keng ex L. Liu, Pl. Res. Gram. 11: 31. 1989." However, this work has in fact never been published. The name is validated here, and the opportunity is taken to provide a full description in English. It has not been possible to trace *McClure 7791*, so the species is typified on another collection at Kew.

As far as is known, *Imperata flavida* is confined to the island of Hainan. It can be readily distinguished from the much commoner *I. cylindrica* (L.) Raeuschel by its shorter spikelet trichomes. The species difference in stigma color is also noteworthy.

Paratypes. CHINA. **Hainan:** Ton Fao Kacheh river, sandy river shore, 300 ft., 14 Jan. 1923, *Eryl Smith s.n.* (K); sine loc., 18 Nov. 1932, *N. K. Chun 44282* (NAS); sine loc., sine dat., *F. A. McClure 7791* (whereabouts unknown).

Saccharum arundinaceum Retzius var. **trichophyllum** (Handel-Mazzetti) S. M. Phillips & S. L. Chen, comb. nov. Basionym: *Erianthus griffithii* J. D. Hooker var. *trichophyllus* Handel-Mazzetti, Akad. Wiss. Wien, Math.-Naturwiss. Kl., Anz. 58: 154. 1921. *Erianthus trichophyllus* (Handel-Mazzetti) Handel-Mazzetti, Akad. Wiss. Wien, Math.-Naturwiss. Kl., Anz. 62: 254. 1926. TYPE: China. Yunnan: 19 Mar. 1914, *H. Handel-Mazzetti 745* (lectotype, designated by Handel-Mazzetti (1936: 1308), WU).

Distribution. China (Yunnan), Sikkim (Sikkim Himalaya, 21 May 1874, *collector illegible 128* (K)).

Erianthus is included within *Saccharum* in the upcoming treatment for Poaceae in the *Flora of China*. Handel-Mazzetti's variety is best placed under *Saccharum arundinaceum*. The species *Saccharum griffithii* is a different taxon with much longer, yellowish callus hairs. It occurs in Pakistan and Afghanistan and is not known from China.

Handel-Mazzetti cited two of his own collections in the 1921 protologue, numbers 745 and 11016. However, later in another publication (1936: 1308) he cited 745 as "typus," which therefore can be accepted as the lectotype. *Handel-Mazzetti 11016* (WU) is a specimen of *Saccharum procerum* Roxburgh. Variety *trichophyllum* appears to be a rather small, locally occurring form of *S. arundinaceum* distinguished mainly by the pilose upper glume of the sessile spikelet. It can be distinguished from the normal form as follows:

Key to Distinguish Two Varieties of *Saccharum arundinaceum*

1a. Culms up to 6 m; upper glume of sessile spikelet glabrous . . . . . *S. arundinaceum* var. *arundinaceum*

1b. Culms up to 1.5 m; upper glume of sessile spikelet thinly pilose . . *S. arundinaceum* var. *trichophyllum*

Polytrias indica (Houttuyn) Veldkamp var. **nana** (Keng & S. L. Chen) S. M. Phillips & S. L. Chen, comb. nov. Basionym: *Eulalia nana* Keng & S. L. Chen, Fl. Hain. 4: 454. 539. f. 1243. 1977. *Polytrias amaura* var. *nana* (Keng & S. L. Chen) S. L. Chen, Fl. Reipubl. Popularis Sin. 10(2): 101. 1997. TYPE: China. Hainan: Dong Fang, along bank of Chang Hua river, 7 Jan. 1956, *Hainan Exped. 531* (lectotype, designated here, IBSC).

This variety, apparently confined to Hainan Island, differs from the typical variety in *Polytrias indica* by the shorter pubescence on the lower glume of the sessile spikelet, as shown in the illustration accompanying the protologue of *Eulalia nana* in *Flora Hainanica* (1997). It was later reduced to varietal level under the species name *Polytrias amaura*, the widely used name for this grass until recently. However, the correct name for the species is *P. indica*, *P. amaura* being a superfluous name, as explained by Veldkamp (1991: 180).

There is a type specimen in the Guangzhou herbarium (IBSC), but because it is uncertain whether this is the holotype, it is selected here as lectotype.

Mnesithea striata (Steudel) Koning & Sosef var. **pubescens** (Hackel) S. M. Phillips & S. L. Chen, comb. nov. Basionym: *Rottboellia striata* var. *pubescens* Hackel, in A. & C. de Candolle, Monogr. Phan. 6: 302. 1889. *Coelorachis striata* var. *pubescens* (Hackel) Bor, Grasses Burma, Ceyl. India Pak.: 121. 1960. TYPE: India. Khasia, *J. D. Hooker & T. Thomson s.n.* (type, K).

Veldkamp et al. (1986) reduced *Coelorachis* to a synonym of *Mnesithea*. Hairy forms of *M. striata* are separated at the varietal level in the upcoming treatment for Poaceae in the *Flora of China*, requiring this new combination.

Acknowledgment. We thank the director of the herbarium at the Vienna Museum (W) for sending the type of *Isachne benekei* on loan to Kew.

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Notes on Grasses (Poaceae) for the *Flora of China*, V. New species in *Cymbopogon*

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ABSTRACT. Two new species of *Cymbopogon* are described from China, *C. liangshanensis* and *C. minor*. Both belong to *Cymbopogon* series *Proceri*, previously mainly confined to Australia. A third species in this series, *Cymbopogon quinhonensis* from Vietnam, is transferred from *Andropogon*.

Key words: China, *Cymbopogon*, Vietnam.

This paper describes two new species in *Cymbopogon* Sprengel from China. Both were recognized as new by Liu Liang, who died in 2001, but neither has been validly published. They represent the first records from continental Asia of *Cymbopogon* series *Proceri* Soenarko, the most primitive series in the genus, which until now was thought to be confined to Australia and parts of Indonesia and New Guinea. The apparent disjunct distribution is bridged by one species in Vietnam, here transferred from *Andropogon* L. to *Cymbopogon*.

Cymbopogon liangshanensis L. Liu ex S. M. Phillips & H. Peng, sp. nov. TYPE: China. Sichuan: Liangshan, 21 Aug. 1964, *Zhu Taiping 411* (holotype, PE).

Haec species omnibus sinensis racemis non deflexis cum spiculis homogamis vestigialibus vel nullis, spiculis pedicellatis redactis manifeste distinguenda; *C. procero* culmis 50–110 cm (non 100–200 cm) altis, internodiis rachidis pedicellisque ciliatis pilis 0.5–1.5 mm (non 6 mm) differt.

Perennial; culms solitary or in small tufts, slender, 50–110 cm tall, ca. 1.5 mm diam., 4- to 6-noded. Leaf blades linear, gray green, 20–30 cm × 3–5 mm, slightly scaberulous, lower blades narrowed almost to midrib toward base; ligule scarious, 1.5–2.5 mm. Inflorescence a spathate compound panicle, 30–40 cm long; branches laxly ascending, bearing several tiers of spathes. Spatheoles greenish brown, narrowly lanceolate, 2–2.5 cm. Racemes paired, 1.5–1.8 cm, 3- to 5-noded; peduncle included within spatheole, glabrous. Raceme bases subequal, linear, not deflexing, apices cupuliform, scarious; homogamous spikelets often absent, or one reduced or vestigial pair present on lower raceme base; rachis internodes and pedicels subequal, slenderly linear, ca. 3/4 length of sessile spikelet, ciliate with ca. 0.5 mm long white trichomes increasing to ca. 1.5 mm at apex, apices of rachis internodes and pedicels expanded, cupuliform, scarious, toothed. Sessile spikelet 3.7–4 mm; callus ca. 0.5 mm, shortly and sparsely pilose; lower glume narrowly elliptic oblong, papyraceous, laterally keeled with inflexed margins, glabrous, back shallowly concave below middle, keels scabrid, unwinged, 2- to 4-veined between keels above middle, narrowed to 2-denticulate apex; upper glume acute; lower floret reduced to an oblong hyaline lemma; upper lemma 2-lobed, awned from sinus; awn geniculate, glabrous, 1.3–1.5 cm; pedicelled spikelet narrow, reduced to the glumes, lower glume 2.5–3.5 mm, upper glume 1–2 mm. Caryopsis not seen.

Distribution. China: southwest Sichuan.

Liu Liang (1997: 197, fig. 48, 1–4) included this species in her account of the genus *Cymbopogon* for volume 10(2) of the Chinese-language *Flora of China*, with a reference to her publication "Plant Resources of Gramineae 11: 14. 1989." In fact, this work has never been published, and her description in 1997 was without a validating Latin description. The species is validated here, and the opportunity is taken to provide a full description in English.

Cymbopogon liangshanensis differs from all other members of the genus in China in possessing a rather lax spathate panicle, and racemes with slender, non-deflexing raceme bases. The homogamous spikelet pair normally present on the lower raceme base in *Cymbopogon* is reduced or vestigial, or even completely absent, and the pedicelled spikelets are

Figure 1. *Cymbopogon minor* B. S. Sun & R. Zhang ex S. M. Phillips & H. Peng. —A. Habit. —B. Spatheole and raceme bases. —C. Spikelet pair. —D. Pedicel with pedicelled spikelet and rachis internode. Drawn from the holotype, *Team of Northeastern Yunnan 1466* (YUNU), by Margaret Tebbs.

similar, being narrow and reduced to the glumes. In these characters the taxon approaches the closely related genus *Andropogon*. However, the subequal raceme bases, and the presence of a homogamous pair (albeit often very small), which is normally completely absent in *Andropogon*, are indicative of *Cymbopogon*.

Cymbopogon liangshanensis appears to be a first

record for continental Asia of *Cymbopogon* series *Proceri*, whose members are otherwise mainly confined to Australia. This is the most primitive series in the genus, including species with equal, frequently non-deflexing raceme bases and reduced pedicelled spikelets. It is distinguished from the Australian *C. procerus* (R. Brown) Domin by its smaller habit and much shorter trichomes in the racemes.

Cymbopogon minor B. S. Sun & R. Zhang ex S. M. Phillips & H. Peng, sp. nov. TYPE: China. Yunnan: Qiaojia County, Xiaohe, bank of Niulan Jiang [river], roadside in grassland, 900 m, 28 Oct. 1964, *Team of Northeastern Yunnan 1466* (holotype, YUNU). Figure 1.

Haec species *C. liangshanensi* affinis, sed laminis foliorum angustioribus (1–2 mm non 3–5 mm latis), spatheolibus angustioribus brevioribus (1.2–1.5 cm non 2–2.5 cm longis), praecipue basibus racemorum deflexis differt.

Perennial, tufted; culms wiry, 60–70 cm tall, 1 mm diam., ca. 4-noded. Leaf blades narrowly linear, pale green, ca. 20 cm × 1–2 mm, smooth, glabrous, narrowed toward base; ligule scarious, 1.3–2 mm. Inflorescence a narrow spathate panicle, moderately dense, up to 30 cm long, spathes and spatheoles in clusters; spatheoles red, narrowly linear, 1.2–1.5 cm; racemes paired, 4- or more-noded (no complete racemes on type); peduncle slender, glabrous, ca. 1/2 length of spatheole, shortly exserted at maturity; raceme bases subequal, short, flattened, deflexed at maturity, pubescent, bearded at apex with ca. 2.5 mm long hairs, apices cupuliform, scarious. Homogamous spikelets reduced, one pair present on lower raceme base, lower spikelet of pair resembling pedicelled spikelets, upper spikelet vestigial; rachis internodes and pedicels subequal, slenderly linear, ca. ¾ length of sessile spikelet, densely ciliate with ca. 0.7 mm long white trichomes increasing to 2–3 mm at apex, apex of internode expanded, cupuliform, scarious, toothed, apex of pedicel similar but smaller; sessile spikelet 3.8–4 mm; callus ca. 0.3 mm, shortly bearded, a trichome tuft projecting into base of lower glume concavity; lower glume narrowly oblong, herbaceous, margins inflexed, lightly keeled below middle, sharply keeled above, glabrous, back shallowly concave below middle, keels scabrid, unwinged, 2- to 4-veined between keels above middle, narrowed to emarginate apex; upper glume acute; lower floret reduced to an oblong hyaline lemma; upper lemma 2-lobed, awned from sinus; awn geniculate, glabrous, 1.2–1.3 cm; pedicelled spikelet narrow, 0.5–2.5 mm, reduced to empty lower glume. Caryopsis not seen.

Distribution. China: northeast Yunnan.

This species is known only from the type specimen, which bears two determination labels, "*Hyparrhenia gracilis* L. Liu, sp. nov." and "*Cymbopogon minor* B. S. Sun et R. Zhang, sp. nov." Neither of these names has been published. The taxon is clearly excluded from *Hyparrhenia* by the short callus of the sessile spikelet, which is inserted into the expanded apex of the rachis internode below. It was correctly placed in *Cymbopogon* by B. S. Sun and R. Zhang, whose specific epithet is taken up here.

Cymbopogon minor resembles *C. liangshanensis*, as described above, in its reduced homogamous and pedicelled spikelets. The small sessile spikelets are also similar, but differ slightly in shape, texture, and a more strongly bearded callus with a trichome tuft. However, it differs markedly by its strongly deflexing, flattened, bearded raceme bases. This makes it rather anomalous in *Cymbopogon* series *Proceri*, into which it would otherwise fit comfortably.

A species described in *Andropogon* from Vietnam by A. Camus also has slender, equal, non-deflexing raceme bases with absent or reduced homogamous pairs, and reduced pedicelled spikelets. It also is best placed in *Cymbopogon* series *Proceri*, and is transferred to the genus here.

Cymbopogon quinhonensis (A. Camus) S. M. Phillips & H. Peng, comb. nov. Basionym: *Andropogon quinhonensis* A. Camus, Bull. Mus. Hist. Nat. (Paris) 25: 204. 1919. TYPE: Vietnam. Annam: Qui-nhon, *Balansa 4872* (holotype, P not seen, K photo).

A. Camus (1919) remarked on the similarity of this grass to *Cymbopogon* in the protologue. It has more conspicuously white-villous racemes than *C. liangshanensis*, and the lower glume of the sessile spikelet lacks intercarinal veins.

Additional specimen seen. VIETNAM. **Annam:** Tourane [Da Nang], border of thickets, May–July 1927, *J. & M. S. Clemens 4454* (K).

Acknowledgment. We thank the directors of the herbaria at PE and YUNU for sending types on loan to Kew.

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Notes on Grasses (Poaceae) for the *Flora of China*, VI. New Combinations in Stipeae and *Anthoxanthum*

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ABSTRACT. When *Oryzopsis* is confined to the type species, Chinese species are placed in *Achnatherum* and *Piptatherum*. This necessitates the following new combinations: *Piptatherum grandispiculum*, *Piptatherum aequiglume* var. *ligulatum*, *Piptatherum tibeticum* var. *psilolepis*, *Piptatherum munroi* var. *parviflorum*, *Achnatherum henryi*, and *Achnatherum henryi* var. *acutum*. *Achnatherum henryi* is lectotypified. The new name *Piptatherum kuoi* replaces the illegitimate name *Piptatherum obtusum*, and this species is lectotypified. *Hierochloe potaninii* is transferred to *Anthoxanthum* as *A. potaninii*, as *Hierochloe* is regarded as a synonym of *Anthoxanthum*. All the grass taxa (Poaceae) listed are endemic to China.

Key words: *Achnatherum*, *Anthoxanthum*, China, *Hierochloe*, *Oryzopsis*, *Piptatherum*, Poaceae.

When preparing the tribe Stipeae, Poaceae, for the *Flora of China*, it was necessary to consider generic concepts in the light of modern research, as discussed below. This has necessitated a few new combinations. The opportunity is also taken in this paper to publish a new combination in *Anthoxanthum* in the tribe Aveneae.

STIPEAE

Delimitation of genera in Stipeae is still in a state of flux, but recent work has led to a realignment of some familiar genera, based in part on molecular studies. Opinion has been divided in the Old World on whether to take a broad view of *Stipa* itself, including *Achnatherum* and some smaller genera, or whether to recognize *Achnatherum* separately. Freitag (1985) took a broad view, as did Cope (1982) and Noltie (2000). However, Russian and Chinese authors have generally kept the two genera separate, for example Tzvelev (1968, 1976) and Lu and Kuo (1987). Barkworth (1993) has published a generic reassessment for North America and, with collaborators, followed this with a report on molecular studies (Jacobs et al., 2000). The two genera are now considered separate in America (Soreng, 2003) and will be also in the treatment of Poaceae for the *Flora of China*.

A further problem involves the genus *Oryzopsis* Michaux. This name has been widely used in both hemispheres, with *Piptatherum* regarded as a synonym, a view reinforced by Freitag's paper (1975) revising the species from southwest Asia. However, the type species of *Oryzopsis*, *O. asperifolia* Michaux (1803) from North America, has many unusual features and is not closely related to other species placed in *Oryzopsis* (Barkworth, 1993). *Oryzopsis* is therefore considered as monotypic in modern treatments (Jacobs et al., 2000; Soreng, 2003), with the other species placed in *Piptatherum* and *Achnatherum*.

Most Chinese species placed in *Oryzopsis* in the Chinese flora (Lu & Kuo, 1987) already have combinations in either *Piptatherum* or *Achnatherum*. However, a few new combinations are required, as set out below. All the taxa listed are endemic to China, or almost so (*Piptatherum kuoi* extends to the Ryukyu islands in Japan and Taiwan).

Piptatherum kuoi S. M. Phillips & Z. L. Wu, nom. nov. Replaced name: *Piptatherum obtusum* (Stapf) Roshevitz, in Bot. Mater. Gerb. Bot. Inst. Komarova Acad. Nauk SSSR 14: 102. 1951, non *Piptatherum obtusum* Nees & Meyen, 1841. *Oryzopsis obtusa* Stapf, in Hooker's Icon. Pl. 24(4): t. 2393. 1895. TYPE: China. Hubei: Ichang and immediate neighborhood, *A. Henry 3507* (lectotype, designated here, K).

This species differs markedly from other *Piptatherum* species in China by its plump, ellipsoid,

glabrous floret and large callus with circular scar. It also has glabrous anthers. The other eight Chinese species (e.g., *P. munroi* (Stapf) Mez) have lanceolate, usually pubescent florets and a very shallow callus with a transversely elliptic scar. The anthers are normally bearded.

The species *Piptatherum aequiglume* (Duthie ex Hooker f.) Roshevitz, *P. tibeticum* Roshevitz, and *P. munroi* (Stapf) Mez belong to a group of closely related species in high parts of western China and the western Himalaya. The following taxa described within this group require transfer from *Oryzopsis*.

Piptatherum grandispiculum (P. C. Kuo & Z. L. Wu) S. M. Phillips & Z. L. Wu, comb. nov. Basionym: *Oryzopsis grandispicula* P. C. Kuo & Z. L. Wu, Acta Phytotax. Sin. 19: 435. t. 1. 1981. TYPE: China. Xizang: Xigazê, Daiduka, 3700 m, 25 Aug. 1963, *Zhi-ye Gin 10210* (holotype, HNWP).

This is a variant with large 8–9 mm spikelets, close to *P. munroi* (Stapf) Mez, but distinguished from that species and others of the group by its smooth leaves and panicle branches.

Piptatherum aequiglume (Duthie ex Hooker f.) Roshevitz var. **ligulatum** (P. C. Kuo & Z. L. Wu) S. M. Phillips & Z. L. Wu, comb. nov. Basionym: *Oryzopsis aequiglumis* Duthie ex Hooker f. var. *ligulata* P. C. Kuo & Z. L. Wu, Acta Phytotax. Sin. 19: 435. 1981. TYPE: China. Yunnan: Lijiang–Heqing, 2800 m, 10 Sep. 1962, *Exped. Zhongdian 2270* (holotype, KUN).

This taxon appears to be a local element from the *Piptatherum aequiglumis–P. munroi* species group. The 8–13 mm ligule is remarkably long, and the 0.4 mm lemma pubescence is longer than in either aforementioned species. It may prove to merit separate specific status when better known.

Piptatherum tibeticum Roshevitz var. **psilolepis** (P. C. Kuo & Z. L. Wu) S. M. Phillips & Z. L. Wu, comb. nov. Basionym: *Oryzopsis tibetica* (Roshevitz) P. C. Kuo var. *psilolepis* P. C. Kuo & Z. L. Wu, Acta Phytotax. Sin. 19: 435. 1981. *Oryzopsis psilolepis* (P. C. Kuo & Z. L. Wu) L. Liu, Vasc. Pl. Hengduan Mountains 2: 2257. 1994. TYPE: China. Sichuan: Anning, 2400 m, 4 July 1959, *Xin Li 78029* (holotype, PE).

This taxon differs from the typical variety by its smooth glabrous lemmas.

Piptatherum munroi (Stapf) Mez var. **parviflorum** (Z. L. Wu) S. M. Phillips & Z. L. Wu, comb. nov. Basionym: *Oryzopsis munroi* Stapf var. *parviflora* Z. L. Wu, Acta Phytotax. Sin. 30(2): 174. 1992. TYPE: China. Qinghai: Menyuan, Zhugu, Xuelongtan, 2700 m, 7 July 1962, *Geobotanical Group 1651* (holotype, HNWP).

This taxon differs only slightly from *P. tibeticum* Roshevitz, but that species is reported to have an ovate floret and 3 to 5 branches at the panicle nodes, whereas *P. munroi* var. *parviflorum* has a lanceolate floret and usually paired panicle branches.

Two species within *Oryzopsis* in the Chinese flora (Lu & Kuo, 1987) fit better into *Achnatherum* than *Piptatherum*, namely *O. chinensis* and *O. henryi*. These had previously been recognized as different from other Chinese species in *Oryzopsis* (Wu & Zhou, 1981), when a new section *Sinoryzopsis* was erected to accommodate them. They are best placed in *Achnatherum* on account of their more or less terete florets with a pubescent callus. The first has already been transferred as *Achnatherum chinense* (Hitchcock) Tzvelev. The second, with its variety, is transferred below.

Achnatherum henryi (Rendle) S. M. Phillips & Z. L. Wu, comb. nov. Basionym: *Stipa henryi* Rendle, J. Linn. Soc., Bot. 36: 382. 1904. *Oryzopsis henryi* (Rendle) Keng ex P. C. Kuo, Fl. Tsinlingensis 1: 145. 1976. TYPE: China. Sichuan: S. Wushan, *A. Henry 5530* (lectotype, designated here, K).

The specimen selected as lectotype from the three syntypes listed in the protologue already bears a lectotype label "selected by H. Freitag." However, this lectotypification has never been published. The selected specimen is the best of the three original syntypes, the other two being poor specimens consisting of only one culm.

Achnatherum henryi var. **acutum** (L. Liu ex Z. L. Wu) S. M. Phillips & Z. L. Wu, comb. nov. Basionym: *Oryzopsis henryi* var. *acuta* L. Liu ex Z. L. Wu, Acta Phytotax. Sin. 19(4): 435. 1981. *Oryzopsis acuta* (L. Liu ex Z. L. Wu) L. Liu, Vasc. Pl. Hengduan Mountains 2: 2257. 1994. TYPE: China. Yunnan: Weixi, 2500 m, 8 Mar. 1940, *K. M. Feng 3729* (holotype, PE).

ANTHOXANTHUM

The genus *Hierochloë* R. Brown was included within *Anthoxanthum* by Schouten and Veldkamp

(1985) because of the morphological intermediates between them. This decision was followed by Noltie (2000) and has been borne out by work on the group for the *Flora of China*, where several intermediates also occur. By unifying these two genera, their close relationship is emphasized, as evidenced by their unusual 3-flowered spikelet structure, with the two lower florets sterile or staminate and modified, and all three falling together from the glumes as one unit. The possession of coumarin, found in this group, does not occur elsewhere in the grasses.

Schouten and Veldkamp made new combinations in *Anthoxanthum* for those species of *Hierochloë* where combinations did not already exist, but omitted one species from China.

Anthoxanthum potaninii (Tzvelev) S. M. Phillips & Z. L. Wu, comb. nov. Basionym: *Hierochloë potaninii* Tzvelev, Rast. Centr. Azii, Mater. Bot. Inst. Komarov 4: 35. 1968. TYPE: China. W Gansu: Li-Dsha-Pu, 20 June 1885, *G. Potanin s.n.* (holotype, LE not seen).

This was reduced to synonymy under *Hierochloë laxa* R. Brown ex Hooker f. (*Anthoxanthum laxum* (R. Brown ex Hooker f.) Veldkamp) by Y. H. Sun and P. C. Kuo (1987). However, the two taxa can be distinguished as follows:

Key to Distinguish *Anthoxanthum potaninii* and *A. laxum*

1a. Leaf blades scabrous; glumes unequal; bisexual floret scabrid near apex . . . . . *A. potaninii*
1b. Leaf blades smooth; glumes subequal; bisexual floret pilose or hirsute toward apex . . . . *A. laxum*

Anthoxanthum laxum occurs on high mountain ledges and in alpine pasture over 3000 m in eastern Afghanistan, northern Pakistan, Kashmir, and Nepal (Cope, 1982), and *A. potaninii* is known only from southern Gansu and western Sichuan provinces of China.

Acknowledgments. We thank the curators at KUN and HNWP for sending types on loan to Kew.

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Five New Combinations in *Gossia* (Myrtaceae) from Melanesia

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ABSTRACT. Based on characters of the fruit, seed, and embryo, five new combinations in *Gossia* N. Snow & Guymer (Myrtaceae) are proposed for species occurring in New Guinea, Vanuatu, or the Solomon Islands. These species previously all had been placed in *Myrtus* L. or *Austromyrtus* Burret. A lectotype is selected for *Gossia aneityensis*. A key is provided for the Melanesian species of *Gossia*.

Key words: *Austromyrtus*, *Gossia*, Melanesia, Myrtaceae, *Myrtus*, Solomon Islands, Vanuatu.

Recent revisionary work in Myrtaceae has led to the splitting of *Austromyrtus* s.l. into *Austromyrtus* s. str., *Lenwebbia* N. Snow & Guymer, and *Gossia* N. Snow & Guymer (Snow et al., 2003). *Gossia* is most species-rich in Australia and New Caledonia, where together approximately 42 species occur (Snow, 2000; Snow et al., 2003). The author is presently revising species of *Gossia* for the *Flore de la Nouvelle-Calédonie* and has had the opportunity to reassess boundaries of all known species of the genus. The following species currently placed in *Myrtus* or *Austromyrtus* are all easily attributable to *Gossia* and are here transferred to that genus based on the amended descriptions of *Austromyrtus*, *Myrtus*, and *Gossia* (Snow et al., 2003). *Gossia floribunda* (A. J. Scott) N. Snow & Guymer, which is most common in Australia, also occurs in New Guinea (Snow et al., 2003).

KEY TO THE SPECIES OF *GOSSIA* FROM NEW GUINEA, THE SOLOMON ISLANDS, AND VANUATU

1. Flowers 5-merous 2
1′. Flowers 4-merous 4
2(1). Branchlets rounded . . . . . *G. eugenioides*
2′. Branchlets 4-angled 3
3(2). Stipular "hairs" prominent, very elongated apically; leaves broadly elliptic, 12–28 mm long; hypanthium densely appressed-pubescent . . . . . *G. versteeghii*
3′. Stipular "hairs" somewhat obscure, only somewhat elongated apically; leaves narrowly elliptic to ovate, 15–75 mm long; hypanthium glabrous to sparsely sericeous . . . . . *G. floribunda*
4(1). Axis of inflorescence with short, spine-like bracts . . . . . *G. salomonensis*
4′. Axis of inflorescence lacking spine-like bracts 5
5(4). Branchlets 4-angled; leaves very narrowly ovate, apex apiculate . . . . . *G. randiana*
5′. Branchlets round; leaves narrowly ovate to ovate, apex acute 6
6(5). Stipular "hairs" obscure (or if present then not swollen at base); style hairy at least near base . . . . . *G. aneityensis*
6′. Stipular "hairs" prominent and greatly swollen at base; style glabrous . . . . . *G. floribunda*

1. Gossia randiana (Merrill & Perry) N. Snow, comb. nov. Basionym: *Myrtus randiana* Merrill & Perry, J. Arnold Arbor. XXIII: 237. 1942. TYPE: Papua New Guinea. Central Division, Kubuna, Dec. 1933, *L. J. Brass 5642* (holotype, A; isotype, BRI).

The holotype specimen has two illustrations in pencil, presumably by Merrill or Perry, that illustrate two characters which in part diagnose *Gossia* from related genera. The first is the circinate embryo, the second is the gelatinous endosperm seen associated with the embryo (Snow et al., 2003).

2. Gossia eugenioides (A. J. Scott) N. Snow, comb. nov. Basionym: *Myrtus eugenioides* A. J. Scott, Kew Bull. 33: 514. 1979. TYPE: Indonesia. Manokwari, Vogelkop, Arfak Mts., Angi gita lake, 2800 m, *A. Kostermans 2398* (holotype, K [photos at BRI, GREE]; isotype, L [photos at BRI, GREE]).

The original description by Scott (1979) indicates only two collections, both from Irian Jaya. In the key to fertile specimens (Snow et al., 2003: 32), *Gossia eugenioides* would key out most closely to *Gossia shepherdii* (F. Mueller) N. Snow & Guymer, but it differs most readily from *G. shepherdii* by its moderate to densely sericeous hypanthium and evident lack of smooth bark. Further information is needed about the biology and distribution of this species.

3. Gossia versteeghii (Merrill & Perry) N. Snow, comb. nov. Basionym: *Myrtus versteeghii* Merrill & Perry, J. Arnold Arbor. XXIII: 238. 1942. TYPE: Indonesia. Irian Jaya, 9 km NE of Lake Habbema, 2800 m camp, Oct. 1938, *L. J. Brass 10618* (holotype, A; isotypes, BRI, K, L).

The stipular "hairs" of *Gossia versteeghii* are unique in the genus. As with the "type B" stipules discussed in Snow et al. (2003: 7), they have a prominently swollen base, but they differ in having a greatly attenuated apex and can be up to 2 mm long.

4. **Gossia salomonensis** (A. J. Scott) N. Snow, comb. nov. Basionym: *Myrtus salomonensis* A. J. Scott, Kew Bull. 35: 412. 1980. TYPE: Solomon Islands. Gizon Island, *R. Mauriasi et al. BSIP 11740* (holotype, K [seen as digital image]).

The species is distinct in *Gossia* by virtue of the number of short spinose bracts occurring in the inflorescence, which are typically aggregated near the base of the pedicel; other species in the genus typically have none or only a few such bracts.

5. **Gossia aneityensis** (Guillaumin) N. Snow, comb. nov. Basionym: *Myrtus aneityensis* Guillaumin, J. Arnold Arbor. XII: 254. 1931. *Austromyrtus aneityensis* (Guillaumin) Burret, Notizbl. Bot. Gart. Berlin-Dahlem 15: 506. 1941. TYPE: Vanuatu (= New Hebrides). Anelgauhat Bay, 23 Feb. 1929, *S. J. Kajewski 810* (lectotype, designated here, P; photos at BRI, GREE; isotypes, BRI, K [photo], MEL).

Guillaumin (1931: 254) indicated that the common name of this species is "Nivic." The selected lectotype is the first of two specimens mentioned in the protologue, which I have seen and which is representative of the species.

Acknowledgments. Thanks to Eve Lucas at the Royal Botanic Gardens, Kew (K), for sending a digital image of the type specimen of *G. salomonensis*; Christiane Tirel and Cecile Aupic at the Muséum National d'Histoire Naturelle (P) for assistance in the herbarium; and the curators of A, BRI, K, L, MEL, and P for permission to borrow or view specimens. The comments of two anonymous reviewers and Victoria Hollowell clarified the manuscript.

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Two New Species of *Rhynchospora* sect. *Tenues* (Cyperaceae) from the Guianas, South America

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ABSTRACT. Two new species are described (*R. cordatachenia* and *R. saxisavannicola*) in *Rhynchospora* sect. *Tenues* Kükenthal from northeastern South America (Guianas). A key to the species of *R.* sect. *Tenues* in the Guianas is given, and illustrations are provided for the new species.

Key words: Cyperaceae, French Guiana, Guianas, *Rhynchospora* sect. *Tenues*, South America, Surinam.

Rhynchospora Vahl nom. cons. is a genus of approximately 270 species (Strong, 2004). It is most diverse in the Western Hemisphere, particularly warm-temperate North America and the Neotropics. Eighty taxa (including infraspecific taxa and the two novelties described here) are currently known from the Guianas (Guyana, Surinam, and French Guiana) (Strong, 2001, 2004).

Of the 18 sections of *Rhynchospora* occurring in the Guianas (Strong, 2004), *R.* sect. *Tenues* Kükenthal is the best represented with 14 species and 1 infraspecific taxon. This high number of taxa reflects the center of diversity and speciation of *Rhynchospora* sect. *Tenues* in savanna ecosystems of northern South America, where there are likely many more species still awaiting discovery. *Rhynchospora* sect. *Tenues* is primarily Neotropical in distribution, but has representatives in tropical Africa, Madagascar, and one species in southeast Asia, *R. gracillima* Thwaites. In the Neotropics, species range from the West Indies and Mexico, south through Central America and northern South America to southern Brazil and northern Argentina. Thomas (1998) treated 16 taxa (including several unknowns) for the Venezuelan highland region of South America. Eleven taxa were treated (including 2 newly described) by Rocha and Luceño (2002) in a treatment of *R.* sect. *Tenues* for Brazil.

In habit, species of *Rhynchospora* sect. *Tenues* can be characterized as low annuals or perennials, less than 0.5 m tall, primarily of sandy savanna and grassland habitats. They typically have linear or subterete, often involute leaf blades; an inflorescence composed of a terminal and 1 or 2 corymbose, open or contracted, partial panicles from the upper bracts; a 2-branched style; and an achene that is transversely rugose or rugulose with vertically oriented linear cells that have finely sinuous walls, a 2-lobed style base, and bristles wanting. Achenes of some species have cells with strongly convex or swollen periclinal walls at their base characteristic of *Rhynchospora* sect. *Spermodontes* Kükenthal, which can be characterized by the two lateral margins of the achene that are generally prolonged and cusp-like at their apices. Two species that Kükenthal (1949, 1950) placed in section *Spermodontes* (*R. fallax* Uittien and *R. tenerrima* Nees ex Sprengel) are particularly characteristic of species in section *Tenues*. They have the linear, vertically oriented epidermal cells and transversely rugulose surface typical of that section. However, the two species exhibit the cusp-like margins of the achene apex characteristic of section *Spermodontes* and the style base is low and often obtusely triangular, sometimes decurrent on the upturned cusp-like margins. Style bases of *Rhynchospora* sect. *Tenues* are generally 2-lobed at base with lobes that extend along the shoulders of the achene apex. However, in some species the lobes are indistinct, e.g., *R. spruceana* C. B. Clarke and *R. albida* (Nees) Böckeler, or unlobed altogether as in *R. caracasana* (Kunth) Böckeler, *R. hirsuta* (Vahl) Vahl, and *R. tenella* (Nees) Böckeler.

The glossy and transversely rugulose achene surface seen in *Rhynchospora* sect. *Tenues* and other *Rhynchospora* species may help protect the embryo and surrounding tissues from lethal temperatures brought by full sunlight in open habitats such as tropical savannas and grasslands. Like lighter surfaces of objects that reflect sunlight and are internally cooler, glossy epicuticular waxes on the achene surface increase reflection of incoming radiation and aid in regulating internal temperature (Eller, 1979). The surface sculpturing of a seed increases its surface area up to 10 times. The surface irregularity may increase energy exchange with the surrounding cooler air and may increase thermodynamic ex-

change by causing turbulence in laminar air flow around the seed surface (Barthlott, 1981).

KEY TO THE SPECIES OF *RHYNCHOSPORA* SECT. *TENUES* IN THE GUIANAS

1. Achene body appearing essentially smooth, at most faintly transversely rugulose 2
1′. Achene body distinctly transversely rugulose, rugose, or pitted-reticulate 3
2(1). Achene body thickly biconvex, tumid, broadly obovate to subrounded, abruptly narrowed to short-stipitate base; style base triangular, blunt at apex; sheaths becoming fibrillose, the base of plant clothed with rusty brown fibers; plant of upland savanna or shrub savanna habitats . . . . . *R. caracasana* (Kunth) Böckeler
2′. Achene body thinly biconvex, not tumid, narrowly obovate, rounded-cuneate at base, estipitate; style base triangular with acute to short-acuminate apex; sheaths not fibrillose; plant of high-elevation tepui habitats . . . . . *R. roraimae* Kükenthal
3(1). Achene body with two oval to rounded protuberances on either side of the base, appearing as though there is a style base on both ends . . . . . *R. riparia* (Nees) Böckeler
3′. Achene body lacking protuberances at base 4
4(3). Leaf blades and sheaths uniformly pubescent . . . . . *R. hirsuta* (Vahl) Vahl
4′. Leaf blades and sheaths glabrous, at most leaf blades ciliate on margins and midveins . . . 5
5(4). Spikelets 1.5–2 mm long; style base forming 2 strap-like lobes proximally, which are decurrent on shoulders of achene body to about the middle, abruptly contracted distally into a short triangular-lanceolate tip . . . . *R. contracta* (Nees) Raynal
5′. Spikelets 2.5–11 mm long; style base not strap-like proximally, trigonous, depressed-trigonous, cap-like, or subdiscoid, not abruptly contracted distally except for *R. saxisavannicola* 6
6(5). Spikelets 6–11 mm long 7
6′. Spikelets 2.5–5.5 mm long 8
7(6). Achene asymmetrically biconvex, thicker near apex, obovate to narrowly obovate, widest at apex, estipitate at base; style base depressed-triangular, entire or scarcely 2-lobed . . . . . *R. spruceana* C. B. Clarke
7′. Achene biconvex, turgid medially, transversely oblong or quadrate, widest at middle, with short-stipitate base; style base triangular, 2-lobed or shallowly 2-lobed . . . . . *R. emaciata* (Nees) Böckeler
8(6). Spikelet scales dark brown on sides; achenes broadly biconvex to nearly globular; style base depressed-trigonous or narrowly discoid, not lobed basally, elliptic as seen from above . . . . . *R. tenella* (Nees) Böckeler
8′. Spikelet scales light brown to stramineous or whitened; achenes biconvex, obovate, obpyriform, subrounded, oblate, or widely transversely oblong (squarish); style base often 2-lobed basally 9
9(8). Achene cordate or rounded-cordate at base; style base narrowly triangular-lanceolate with a flaring, 2-lobed base (shaped like a witch's hat) . . . . . *R. cordatachenia* M. T. Strong
9′. Achenes narrowed or subrounded at base; style base triangular or depressed-triangular 10
10(9). Achenes subrounded, oblate, widely transversely oblong, or quadrate, narrowed abruptly to a stipitate base, often with a longitudinal dark gray band or patch medially on each side 11
10′. Achenes obovate, obpyriform, or subrounded, gradually narrowed to base, brown, pale brown, or flecked with gray 12
11(10). Achenes rounded to oblate; style base triangular, shallowly and shortly 2-lobed, 0.1–0.2 mm wide at base . . *R. junciformis* (Kunth) Böckeler
11′. Achenes transversely oblong or quadrate; style base depressed-trigonous, broadly 2-lobed, 0.6–0.9 mm wide at base . . *R. emaciata* (Nees) Böckeler
12(10). Achene narrowly obovate, coarsely rugose with 5 to 6 rugae per face . . . . . *R. sanariapensis* Steyermark
12′. Achene obovate or elliptic, rugulose with 7 to 12 rugae per face 13
13(12). Roots often golden yellow; scales stramineous to whitened; achene obpyriform, cuneate at base, short-stipitate; style base cap-like, indistinctly 2-lobed, the lobes not extending along shoulders of achene body . . . . . *R. albida* (Nees) Böckeler
13′. Roots brown; scales light brown; achene obovate, broadly obovate, broadly elliptic, or subrounded, estipitate; style base distinctly 2-lobed, the lobes extending along shoulders of achene body 14
14(13). Spikelet rachilla strongly flexuose at maturity; achenes 0.5–0.7 mm wide; base of style base 0.2–0.3 mm wide; only known from French Guiana and Surinam in rock savanna and seeps on granitic outcrops (inselbergs) . . . . . *R. saxisavannicola* M. T. Strong
14′. Spikelet rachilla not strongly flexuose; achenes 0.8–1 mm wide; base of style base 0.5–0.7 mm wide; wide-ranging savanna species 15
15(14). Corymb rays elongate: spikelets straight or nearly so, 4–5 mm long; anthers 2–3 mm long; achenes obovate, 1–1.4 mm long . . . . *R. tenuis* Willdenow ex Link subsp. *tenuis*
15′. Corymb rays short; spikelets falcate, 2–4 mm long; anthers 0.8–1 mm long; achenes subrounded-obovate, 0.6–0.9 mm long . . . *R. tenuis* subsp. *austrobrasiliensis* T. Koyama

In preparing *Rhynchospora* for the *Flora of the Guianas*, I noted two novelties, which are here described and validated.

Rhynchospora cordatachenia M. T. Strong, sp. nov. TYPE: French Guiana. Environs de Cayenne, Savane du Gallion, 9 Sep. 1979, *A. Raynal-Roques 21566A* (holotype, US-3464701) [originally mixed with *Rhynchospora tenerrima* Nees ex Sprengel; distributed as *A. Raynal-Roques 21566*]. Figure 1.

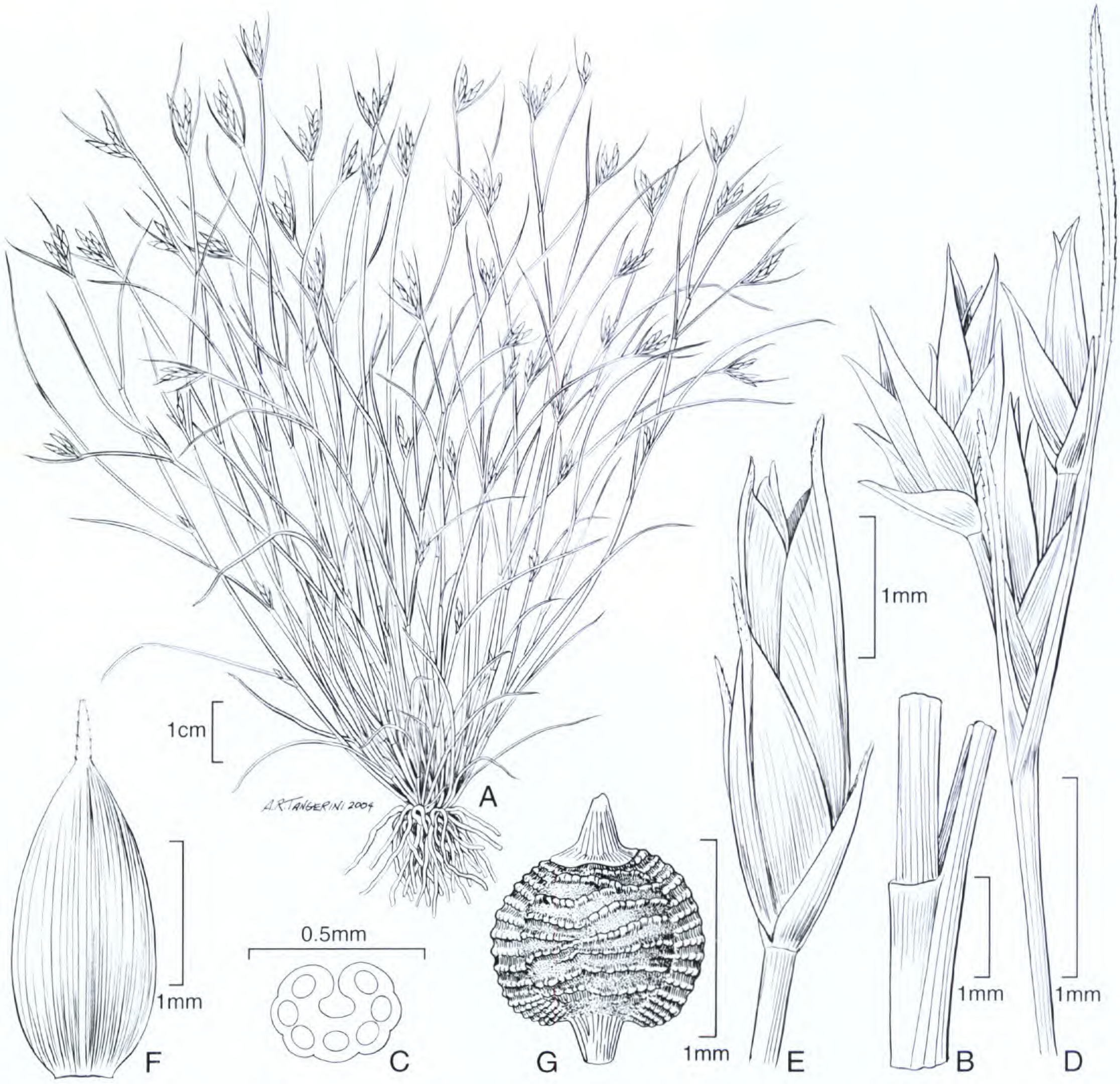

Figure 1. *Rhynchospora cordatachenia* M. T. Strong. —A. Habit. —B. Detail of junction of sheath and leaf blade. —C. Cross section of leaf blade. —D. Detail of inflorescence. —E. Spikelet. —F. Spikelet scale. —G. Achene. Drawn from the holotype, *A. Raynal-Roques 21566A* (US).

A ceteris speciebus sectionis *Tenuium*, achenio ad basim cordato, rostro simili petaso venificae ad basim dilatato differt.

Caespitose perennial, 7–13 cm tall; rhizome short; roots fine, light brown; culms spreading-ascending, 0.3–0.6 mm wide, filiform, obtusely trigonous to terete or nearly so, soft, flexuous, finely ribbed, pale green to stramineous, glabrous. Leaves 1 to 3 per culm, ascending, basal and lower cauline, 0.1–10 cm long; sheaths short, closely clasping culm, ligulate with a narrow band of tissue present at adaxial junction of sheath and blade, herbaceous, finely ribbed, light brown to stramineous distally, glabrous, the inner band membranous, truncate at apex, brown, tinged with red; blades filiform, 0.2–0.4 mm wide, involute to crescentiform-capillary, herbaceous, cellular-reticulate adaxially, finely veined abaxially, green, glabrous, margins smooth proximally, antrorsely scabrous toward apex, attenuate to subflattened tip. Inflorescence a terminal and 1 or 2 lateral corymbose partial panicles from the upper bracts, the terminal panicle 4–9 × 2–5 mm, with 3 to 6 spikelets; bracts leaf-like, 1–7 cm long, the axillary one elongate and often exceeding subtending panicle; branches short, very slender and filiform, flattened-trigonous or subterete in cross section; spikelets slenderly ellipsoid-lanceoloid, 3–4 × 0.6–1 mm, straight, acuminate to apex, narrowly cuneate at base; rachilla strongly flexuose at maturity; scales dorsally obtuse to rounded, herbaceous, distal

scales of spikelet thinly herbaceous to submembranous, brown, proximal and medial scales thickly herbaceous, smooth and glossy, uniformly pale brown, glabrous, margins scarious, midcosta very fine, indistinct proximally, prolonged beyond the obtuse to acute apex as a short antrorsely scabrous awn, which is slightly recurved, lateral nerves indistinct; fertile scales 5 to 6, ovate-elliptic to ovate-lanceolate or lanceolate, 2–2.7 × 0.9–1.2 mm; sterile scales 2 at base of spikelet, ovate-elliptic, 1.2–1.5 × 0.5–0.8 mm. Flowers bisexual; stamens 1, the anthers 0.6–0.8 mm long, apiculate at apex, minutely papillose at base, basifixed, thecae parallel, longitudinally dehiscent; style 2-branched, equaling to 2/3 length of unbranched portion, long-exserted from subtending scale. Achene unequally biconvex, ovate-rounded or somewhat ovate-quadrate, 0.8–0.9 × 0.7–0.8 mm, obtuse to subtruncate at apex, cordate to slightly so at base, narrowly stipitate, transversely rugulose with 6 to 7 rugae per face, narrowly cellular-reticulate along margins and at base, shiny with a crystalline appearance, whitish tinged with brown; epidermal cells linear, vertically oriented; style base narrowly triangular-lanceolate with a flaring, 2-lobed base, flattened, 0.4 × 0.3–0.4 mm, attenuate to apex, brown to dark brown; bristles absent.

Distribution and habitat. Endemic to French Guiana in coastal plain savanna. Known only from the type collection (see citation above).

Distinguishing features. Among the species of *Rhynchospora* sect. *Tenues*, *R. cordatachenia* is unique in having an achene with a cordate base and a style base that is narrowly triangular-lanceolate with a flaring, 2-lobed base (shaped like a witch's hat).

Rhynchospora saxisavannicola M. T. Strong, sp. nov. TYPE: French Guiana. Mont Saint-Marcel, zone sud-est du massif, mares gravillonnaires de savane-roche, 300 m, 02º23′00″N, 53º00′20″W, 18 July 2002, *J. J. DeGranville, L. Aliker & C. Sarthou 15283* (holotype, US-3451946; isotypes, CAY, NY, P). Figure 2.

A ceteris speciebus sectionis *Tenuium*, achenio late elliptico, rostro non profunde triangulari ad apicem abrupte brevi-attenuato differt.

Caespitose perennial, 3–10 cm long; rhizome short; roots fine, light brown; culms erect, 0.2–0.5 mm wide, filiform, flattened-trigonous or subterete, soft, flexuous, finely ribbed, pale green, glabrous. Leaves 1 to 3, ascending, primarily basal, 2–5 cm long; sheaths short, closely clasping culm, ligulate with a narrow band of tissue present at adaxial junction of sheath and blade, herbaceous, finely ribbed, pale brown to stramineous proximally, glabrous, the inner band membranous distally on basal sheaths, herbaceous on upper cauline sheaths except for membranous orifice, truncate at apex; blades compressed-filiform, 0.2–0.3 mm wide, herbaceous, finely veined, glabrous, the apex often curving. Inflorescence 1 to 3 corymbose, lax, partial panicles from the upper bracts, the terminal panicle 5–10 × 3–15 mm, with 1 to 5 spikelets; bracts leaf-like, to 3 cm long; branches very slender and filiform, flattened-trigonous or subterete in cross section; spikelets slenderly ovoid-lanceoloid, 3–4.5 × 0.5–0.9 mm, straight, acuminate to attenuate at apex, cuneate at base; rachilla strongly flexuose at maturity; scales dorsally obtuse to rounded, herbaceous, distal scales of spikelet thinly herbaceous to submembranous, minutely cellular-striate, semiglossy, reddish brown with slightly darker brown lineations, glabrous, margins narrowly scarious, midcosta very fine, indistinct except at apex, prolonged beyond the narrowly acute to acuminate apex as a short antrorsely scabrous awn that is slightly recurved, lateral nerves indistinct; fertile scales 3 to 4, ovate-lanceolate to lanceolate, 2–3 × 0.9–1.3 mm; sterile scales 2 or 3 at base of spikelet, ovate-elliptic, 1–2 × 0.3–1.2 mm. Flowers bisexual; stamens 3, the anthers ca. 1 mm long, apiculate at apex, basifixed, thecae parallel, longitudinally dehiscent; style 2-branched, equaling to 2/3 length of unbranched portion, long-exserted from subtending scale. Achene biconvex, elliptic to broadly so or subrounded, 0.6–0.8 × 0.5–0.7 mm, rounded at apex, obtuse at base, transversely rugulose with 5 or 6 rugae per face, narrowly cellular-reticulate along margins and at base, shining, glossy, stramineous to brown, often with a longitudinal gray stripe medially; epidermal cells linear, vertically oriented; style base shallowly triangular, 0.1 × 0.2–0.3 mm, abruptly short-attenuate at apex, shallowly 2-lobed at base, or indistinctly so, the ends of the lobes often slightly upturned, brown or blackish; bristles absent.

Distribution and habitat. French Guiana and Surinam. Seeps and pools in savane-roche (rock savanna) and granitic outcrops, 280–450 m.

Distinguishing features. Among the species of *Rhynchospora* sect. *Tenues*, *R. saxisavannicola* can be distinguished by the combination of a strongly flexuose spikelet rachilla, elliptic to broadly elliptic achene body, and shallowly triangular, abruptly short-attenuate style base.

Paratypes. SURINAM. Sipaliwini Savanna area on Brazilian frontier, in valley on saddle betw. two "4-Gebroeders" mtn. tops, in trickling zone at edge of sloping

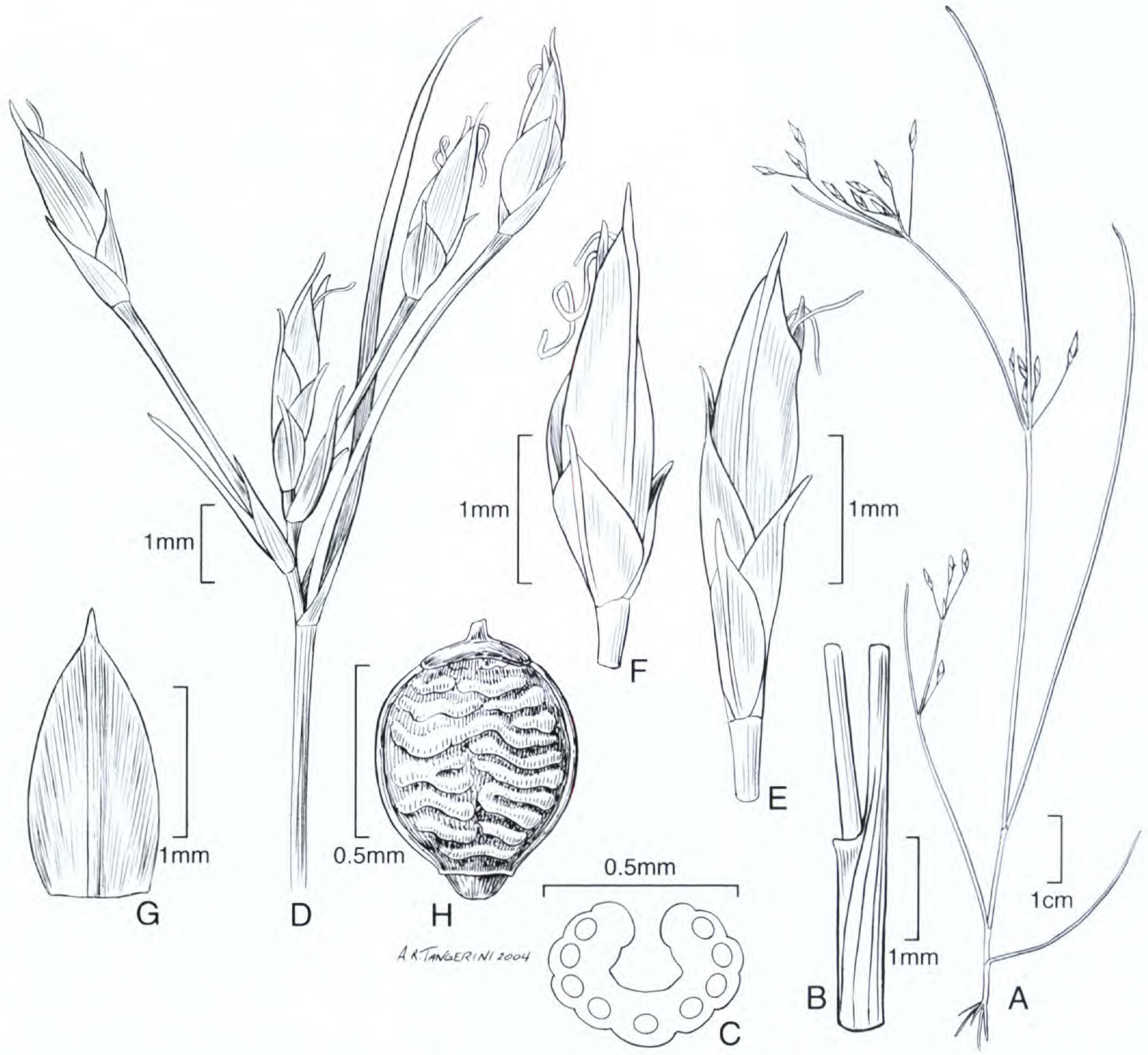

Figure 2. *Rhynchospora saxisavannicola* M. T. Strong. —A. Habit. —B. Detail of junction of sheath and leaf blade. —C. Cross section of leaf blade. —D. Detail of inflorescence. —E, F. Spikelets. —G. Spikelet scale. —H. Achene. Drawn from the holotype, *J. J. DeGranville, L. Aliker & C. Sarthou 15283* (US).

granitic outcrop, 450 m, 10 Oct. 1968, *F. H. F. Oldenburger, R. Norde & J. P. Schulz 254* (U); Sipaliwini Savanna area on Brazilian frontier, 280 m, 24 Jan. 1969, *F. H. F. Oldenburger, R. Norde & J. P. Schulz 986* (U).

Acknowledgments. This paper is number 97 in the Smithsonian Institution's Biological Diversity of the Guiana Shield (BDGS) Program publication series. A floristic treatment of the Cyperaceae (sedges) for the *Flora of the Guianas* is in preparation by the author and collaborators. I thank Dan Nicolson (US) and Gerry Moore (BKL) for reviewing the manuscript; an anonymous reviewer for correcting the Latin; and Alice Tangerini (US) for rendering the superb illustrations.

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Pinellia koreana (Araceae), a New Species from Korea

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ABSTRACT. A new species in Araceae, *Pinellia koreana*, is described from South Korea. *Pinellia koreana* differs from *P. yaoluopingensis*, *P. pedatisecta*, and *P. ternata* by having 3-foliolate leaves with bilobed lateral leaflets when mature and only petioles bearing bulbils. A polyploid chromosome number is reported for the new species ($2n = 104$), representing an octoploid series from a base number $x = 13$.

Key words: Araceae, chromosome number, Korea, *Pinellia*.

The genus *Pinellia* Tenore (Araceae) consists of about 10 species restricted to warm temperate and temperate East Asia (Mayo et al., 1997). All species are small plants, and some are popular as horticultural subjects. In Korea and China *Pinellia* is used for herbal medicine, particularly for chest complaints.

Taxonomic studies on the genus have concentrated on morphology (Li et al., 1977; Wu & Li, 1979; Li et al., 1997a) and cytological studies (Kurakubo, 1940; Ito, 1942; Suzuka, 1953; Jones, 1957; Marchant, 1972; Li et al., 1997b).

Pinellia in Korea was reported by Nakai (1911), Chung et al. (1937), and Chung (1956) as consisting of a single species, *Pinellia ternata* (Thunberg) Breitenbach. Yang (1958) reported that the genus *Pinellia* in Korea consisted of two taxa, *Pinellia ternata* and *Pinellia ternata* var. *viridis* Makino, but *P. ternata* var. *viridis* was a synonym of *P. ternata*. Toh (1978) undertook a taxonomic study to investigate differences of morphological features, anatomical structures, and histochemical and cytological characteristics between *P. ternata* and *P. tripartita* Schott, the latter not recorded from Korea.

While studying the genus in Korea, we found a population of *Pinellia* that does not belong to any taxon hitherto described. The plants grow along the Hwa-um valley of the southern slope of Mt. Chiri. The population of *P. koreana* in the type locality occupies a small area of ca. 100 m^2 and consists of about 25 individuals. We herein describe and illustrate this new species of *Pinellia* from Korea.

Pinellia koreana K. H. Tae & J.-H. Kim, sp. nov.

TYPE: Korea. Jeollanam-do Province, Mt. Chiri, grassy slopes in Hwa-um valley, 480 m, 10 June 1999, *K. H. Tae 99-001* (holotype, TUT).

Korean name: Ji-Ri-Ban-Ha.

Herba perennis usque ad 40 cm alta; tuber globosum 1.0–2.0 cm diametro. Folia 2, ovata, 3-foliolata, iterum scissa in extrinsecus 2-foliolata, 10–12 cm longa, 7–11 cm lata; petiolis 13–20 cm longis. Pedunculi 23–30 cm longi; spatha erecta. Numerus chromosomatum $2n = 104$ ($8x$).

Perennial herb, to 40 cm tall. Tuber globose, 1.0–2.0 cm diam. Leaves 2. Petiole greenish, 13–20 cm long, base sheathing. Bulbils present in sheath at lower part of petiole, 7–8 mm diam. Blade ovate in outline, green, trifoliolate, lateral leaflets bilobed when mature, green, 10–12 cm long, 7–11 cm wide. Peduncle green, solitary, longer than the petiole, 23–30 cm. Spathe green outside, typically light purplish green within, tube narrowly cylindric, 6–7 cm long. Spadix with pistillate portion basal, 1.5–1.8 cm long, staminate portion above, 0.9–1.2 cm long, and appendix violet to green (Fig. 1). Berries ovoid, greenish white, stigma persistent. Somatic chromosome number $2n = 104$.

Flowering May–June.

The new species (Fig. 1) appears to be closely related to *Pinellia ternata*. The characteristic features and differences among related species are summarized in Table 1. The new species differs from the three other species in the leaf shape and the position of the bulbils. Somatic chromosome numbers of *Pinellia koreana* were established as $2n = 104$. This represents the first cytological report for the new species, which is seen as octoploid, from an $x = 13$ series. The plants examined cytologically were collected from the type population on Mt. Chiri on 10 June 1999 (*K. H. Tae 99-001*, TUT).

Pinellia koreana is distinguished from *P. yaoluopingensis* X. H. Guo & X. L. Liu, *P. pedatisecta* Schott, and *P. ternata* in having trifoliolate leaves with bilobed lateral leaflets when mature, only petioles bearing bulbils (Fig. 1), and somatic chromosome numbers ($2n = 104$, Table 1, Fig. 2). Re-

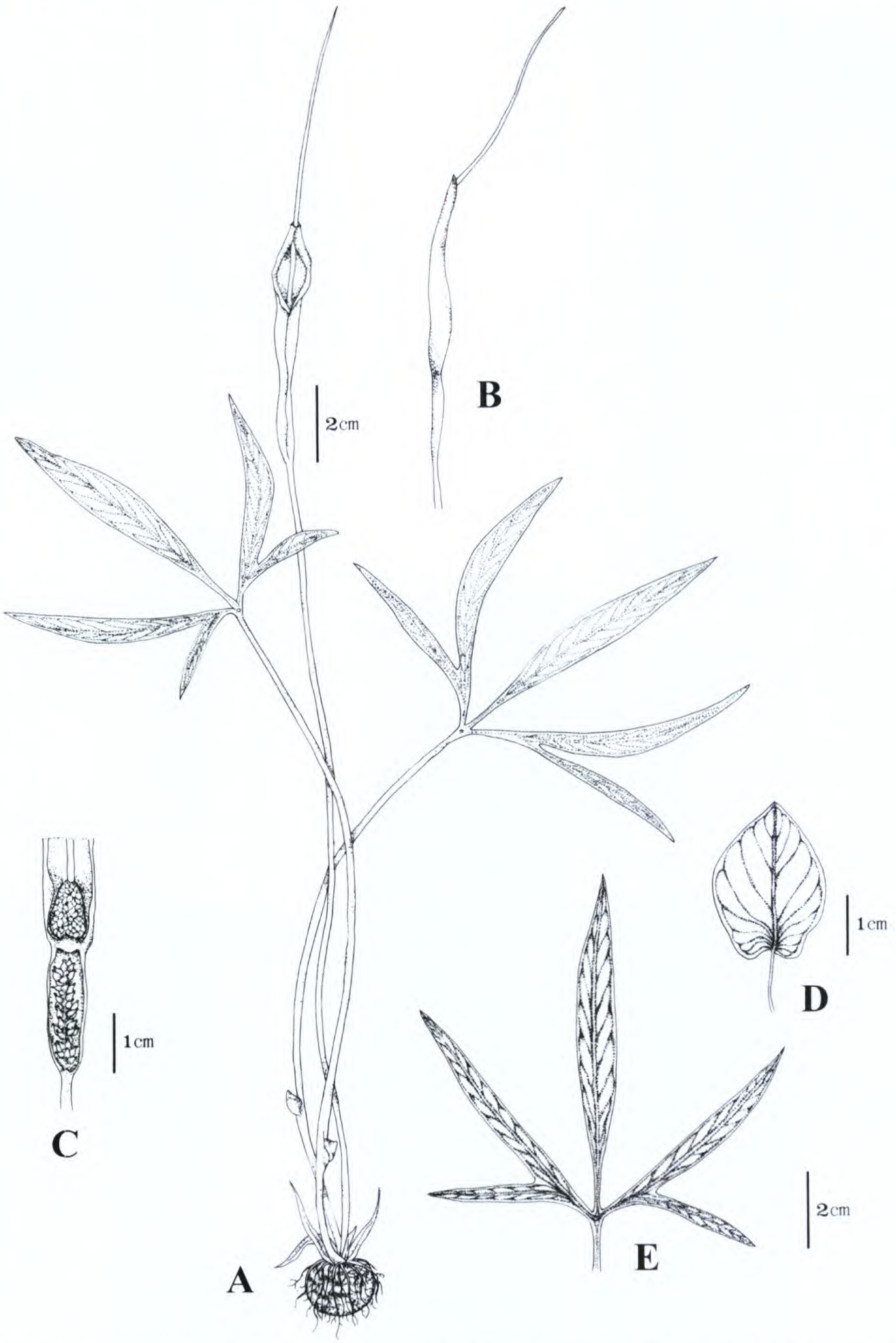

Figure 1. *Pinellia koreana* K. H. Tae & J.-H. Kim. —A. Habit. —B. Spathe and spadix. —C. Monoecious flowers, showing staminate flowers on the upper portion, and pistillate flowers on the lower portion of the spadix. —D. Young leaf. —E. Mature leaf. Drawn from the holotype, *Tae 99–001* (TUT).

Table 1. Diagnostic morphological and cytological characters of the new species and closely related taxa. The chromosome numbers of *P. yaoluopingensis*, *P. pedatisecta*, and *P. ternata* are based on Kurakubo (1940); Ito (1942); Malvesin-Fabre (1945); Huttleston (1953); Suzuka (1953); Jones (1957); Marchant (1972); Guo and Liu (1986); and Li et al. (1997b).

Characters	*P. yaoluopingensis*	*P. pedatisecta*	*P. ternata*	*P. koreana*
Distribution	China	China	China, Korea, Japan	Korea
Leaflet number (blade)	3(to 5)	6 to 11	3	3 (5-parted)
Petiole	deep green with purple spots	green	green	green
Bulbils	present only in tuber-top	absent	present in petiole and leaf	present only in petiole
Spadix	green	yellow	green	green
Flowering period	May–July	June–July	May–July	May–June
Somatic chromosome # (basic #)	$2n = 26$ ($x = 13$)	$2n = 26$ ($x = 13$)	$2n = 28, 54, 72, 99, 108, 116, 128$ ($x = 7, 8, 9, 29$)	$2n = 104$ ($x = 13$)

cently, Li et al. (1997) discussed the taxonomic relationship among *Pinellia* species in China based on bulbil patterns and chromosome numbers. They suggested that the basic chromosomes $x = 7, 8, 9$ were derived from $x = 13$. Therefore, *P. koreana* may be interpreted as one of the primitive chromosomal type $x = 13$, from an octoploid series to $2n = 104$.

Acknowledgments. This research was supported by a grant (PF001301–01) from the Plant Diversity Research Center of the 21st Century Frontier Research Program funded by the Ministry of Science and Technology of the Korean government. We thank Miss Hye-ryon Kim for the illustration of the type specimen.

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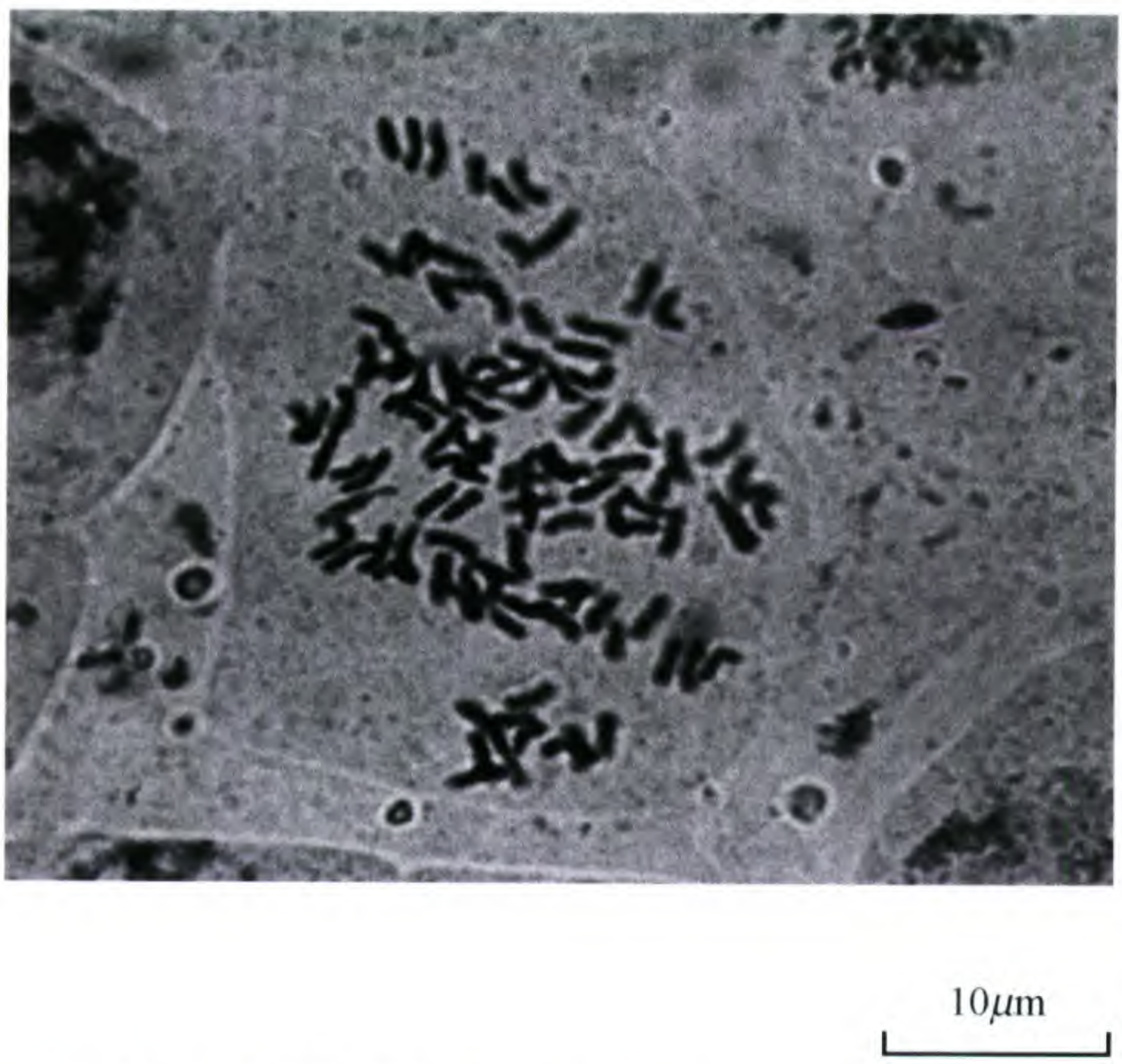

Figure 2. A chromosome photograph of *Pinellia koreana* ($2n = 104$).

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A New Combination in Chinese *Aesculus* (Hippocastanaceae)

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ABSTRACT. In the context of the present authors' revision of the Hippocastanaceae for the forthcoming *Flora of China*, Volume 12, two Chinese endemic taxa, *Aesculus chinensis* Bunge and *A. wilsonii* Rehder, are treated as conspecific. The latter taxon, represented by wild plants, is here recombined as *A. chinensis* var. *wilsonii* (Rehder) Turland & N. H. Xia, comb. et stat. nov. *Aesculus chinensis* var. *chinensis*, with *A. chekiangensis* Hu & W. P. Fang (*A. chinensis* var. *chekiangensis* (Hu & W. P. Fang) W. P. Fang) in synonymy, is represented by cultivated plants and is unknown with certainty in a wild state.

Key words: *Aesculus*, China, Hippocastanaceae.

The genus *Aesculus* L. (Hippocastanaceae) comprises ca. 12 species of deciduous trees with palmate leaves, showy flowers borne in thyrses, and large seeds (buckeyes or horsechestnuts). They are disjunctly distributed in North America (including Baja California), southeastern Europe, and Asia from the Himalayas to Japan.

In the context of the present authors' revision of the Hippocastanaceae for the forthcoming *Flora of China*, Volume 12, four species are here recognized as occurring in China. One is endemic: *Aesculus chinensis* Bunge, under discussion here; one is rather widely distributed from Sikkim to northern Vietnam and southern China: *A. assamica* Griffith; and two are introduced: *A. hippocastanum* L., from the Balkan peninsula in Europe, and *A. turbinata* Blume, from Japan.

Aesculus chinensis (Bunge, 1833: 10) was originally described from cultivated material from the Beijing area. It is characterized by having petiolules 0.5–2.5(–3) cm long, leaflet blades 8–25(–30) cm long; thyrses cylindric, 15–35 cm long; petals white with yellow spots, subequal, oblong-obovate to oblong-oblanceolate, 8–14 × 3–5 mm; anthers 1–1.5 mm long; and capsules dotted but smooth.

Cultivated plants from southern Jiangsu and northern Zhejiang provinces were described as *Aesculus chekiangensis* Hu & W. P. Fang (Fang, 1962: 86; repeated by Fang & Hu, 1965: 218), which was later reduced to varietal rank (Fang, 1981: 277), as *A. chinensis* var. *chekiangensis* (Hu & W. P. Fang) W. P. Fang. However, they are scarcely distinguishable from plants in the Beijing region and in fact have some features that were thought to distinguish *A. wilsonii* Rehder (see below), namely a thinner pericarp and a smaller hilum (Rehder, 1913: 499; Hardin, 1960: 35).

Aesculus wilsonii (Rehder, 1913: 498) was described from wild plants in Chongqing, western Hubei, and Sichuan provinces, and in its typical form differs from *A. chinensis* in the above-mentioned features and in having leaf blades abaxially pubescent (vs. more or less glabrous) with a more rounded base (vs. cuneate). Within the range of *A. wilsonii* occur numerous intermediates with *A. chinensis*, as was noted by Hardin (1960: 34), who hypothesized that the latter species might only be a cultivated form of the former. The comment by Fang (1981: 276, in Chinese) about native plants of *A. chinensis* existing in the Qin Ling mountain range (southern Shaanxi province) was possibly based on a comment by Rehder (1913: 500), which was questioned by Hardin (1960: 34), who noted "the specimens which I examined from Shensi [i.e., Shaanxi] represent a form of *A. wilsonii*." Indeed, among the intermediates mentioned above are the same gathering seen by Hardin (*F. N. Meyer 1725*, A, MO) and another from Mianxian County in southwestern Shaanxi (*K. J. Fu 5630*, MO).

While the extreme forms can easily be assigned to either *Aesculus chinensis* or *A. wilsonii*, the existence of so many intermediates makes it impossible to delimit species and difficult even to justify infraspecific taxa. We have therefore decided to recognize one variable species, *A. chinensis*, but nevertheless to retain a separate status for the wild plants, as *A. chinensis* var. *wilsonii* (Rehder) Tur-

land & N. H. Xia. Such a treatment would not be at odds with two recent analyses. Forest et al. (2001) published a cladistic analysis of *Aesculus* based on morphology only. The two most parsimonious trees obtained showed no resolution between *A. chinensis* and *A. wilsonii*, or for that matter between those two taxa and the only other native Chinese species: *A. assamica*. Xiang et al. (1998) published a molecular phylogenetic analysis in which the single most parsimonious tree based on internal transcribed spacer (ITS) sequences showed *A. chinensis* and *A. wilsonii* as sister taxa, the former supported by eight nucleotide changes and the latter by six. *Aesculus assamica* (therein as "*A. wangii*") was shown as sister to the A. chinensis–A. wilsonii clade, supported by 30 nucleotide changes. "*Aesculus wangii* Hu" was not validly published by either Fang (1962: 99) or Fang and Hu (1965: 227, as "*wangi*") because in both cases two gatherings were indicated as types (*Sino-Ross. Exped. 580*, PE, and *K. M. Feng 12943*, PE), both of which are clearly referable to *A. assamica*. The analysis of Xiang et al. (1998) did not include other accessions of *A. assamica* in addition to that given as "*A. wangii*."

The two varieties of *Aesculus chinensis* may be summarized as follows. The provincial distributions are based on the herbarium specimens examined by the present authors (A, GH, IBSC, MO, PE) and the data given by Rehder (1913), Hardin (1960), and Fang (1962, 1981).

Aesculus chinensis var. *chinensis* (including *A. chekiangensis*) has leaflet blades abaxially glabrous, or grayish tomentose on the veins when young, and the leaflet blade base cuneate to broadly so. It is cultivated, especially in temple grounds and by houses, at elevations below 800 m, and is not known with certainty in a wild state. It has been recorded from the following provinces in China: Hebei, northern Henan, southern Jiangsu, southern Shaanxi, southern Shanxi, and northern Zhejiang.

Aesculus chinensis var. *wilsonii* has leaflet blades abaxially more or less uniformly grayish tomentose or villous, or grayish tomentose on the veins (sometimes only when young), and the leaflet blade base cuneate to rounded or slightly cordate. It grows in broad-leaved forests, near streams in tall shady forests, woods, thickets, mountain and hill slopes, ravines, and roadsides, at elevations of 600–2000(–2300) m, and is also sometimes cultivated. It has been recorded from the following provinces in China: Chongqing, southern Gansu (Kangxian: *Y. S. Lian 96405*, MO), northern Guangdong, Guizhou, southwestern Henan, western Hubei, Hunan, western Jiangxi, southern Shaanxi, Sichuan, and northeastern Yunnan.

Aesculus chinensis Bunge var. **wilsonii** (Rehder) Turland & N. H. Xia, comb. et stat. nov. Basionym: *Aesculus wilsonii* Rehder, in Sargent, Pl. Wilson. 1: 498. 1913. TYPE: China. Sichuan: Wenchuan County, "Hsin Wên Ping, 3400 ft.," 1 June 1908 (fl), *E. H. Wilson 200* (lectotype, designated by Hardin (1960: 35), A, sheet no. 50582).

Acknowledgments. We thank David E. Boufford and Anthony R. Brach (both A, GH) for making the first author's visit to Harvard University Herbaria in February 2005 such a pleasant one and for providing a copy from the Harvard library of Fang's 1962 paper. We also thank Guanghua Zhu (MO) for obtaining digital images of *Aesculus* types at PE.

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Eurya luchunensis, a New Species of Theaceae from Yunnan, China

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ABSTRACT. *Eurya luchunensis* J. H. Wang & H. Wang, a new species of Theaceae from Luchun County in southern Yunnan, China, is described and illustrated. It was collected in a tropical broad-leaved secondary forest or montane rain forest on Mt. Huanglian-shan. This species is very similar to *Eurya pseudocerasifera* Kobuski, from which it differs by having lanceolate to oblong-lanceolate leaves, 20- to 24-locellate anthers, and the first-year branches, as well as the pedicels, bracteoles, and sepals, being glabrous or subglabrous.

Key words: China, *Eurya luchunensis*, Theaceae, Yunnan.

Established in 1783 by Thunberg, *Eurya* is a genus of evergreen shrubs or small trees, rarely larger trees to 2–5 m tall. There are over 130 species distributed primarily in eastern and southeastern Asia, Indo-Malesia, and islands in the southwestern Pacific Ocean. There are 81 known species for China, among which approximately 41 occur in Yunnan (Ming & Bartholomew, in press; Ling, 1998).

During our study of all specimens of the genus *Eurya* deposited in the KUN herbarium, we found collections from Luchun County, southern Yunnan, that were rather similar to *E. pseudocerasifera* Kobuski, which is distributed in southwestern to northwestern Yunnan and southeastern Xizang in China. These specimens have 20- to 24-locellate anthers, are glabrous or subglabrous in the first-year branches, pedicels, bracteoles, and sepals, and have lanceolate to oblong-lanceolate leaves. However, the anthers are 5- to 10-locellate in *E. pseudocerasifera*, which further differs by being pubescent in the first-year branches, pedicels, bracteoles, and sepals, as well as having leaves that are oblong-elliptic. The Luchun specimens represent a new species.

Eurya luchunensis J. H. Wang & H. Wang, sp. nov. TYPE: China. Yunnan: Luchun County, Mt. Huanglian-shan, 1700 m, 19 Oct. 1973, *D. D. Tao 1101* (holotype, KUN). Figure 1.

Euryae pseudocerasiferae valde affinis, sed foliis anguste oblongo-lanceolatis vel lanceolatis, (9–)11–18 cm longis, 2–4 cm latis, apice falcato- vel caudato-acuminatis 2–3 cm longis, subtus secus costam adpresso-pilosis, postremo saepe glabrescentibus, nervis lateralibus reticulatisque utrinque prominentibus, petiolis 1–1.3 cm longis, bracteolis sepalisque glabris, thecis antherarum 20 to 24 loculatis, ovariis glabris differt.

Shrubs or small trees, 2–5 m tall; first-year branches brown, terete, glabrous, or sparsely pubescent at the apex; terminal buds pubescent. Leaf blades leathery, narrowly oblong to lanceolate, (9–)11–18 × 2–4 cm, apex long-acuminate with an acumen 2–3 cm long, base widely cuneate, margin entire or sparsely serrate near apex, dark green above, shiny, glabrous, light green below, midribs impressed above and prominent below, sparsely appressed pubescent along the midribs, becoming glabrescent later, drying purple, secondary veins 11 to 13 on each side of midrib, prominent on both sides together with the reticulate veins; petioles 1–1.3 cm long, deeply impressed above, sparsely pubescent or glabrescent below. Inflorescence of solitary axillary flowers or 2 to 4 in a cluster; pedicels 4–6 mm, sparsely pubescent or glabrescent; staminate flowers: with bracteoles 2 or 3, broadly ovate or orbicular, 1.5–2 mm, glabrous, margin ciliolate; calyx with 5 sepals, orbicular, ca. 4 mm diam., apex rounded and with a retuse tip, outside glabrous, sparsely pubesecent, margin ciliolate; corolla with 5 petals, not fully open; stamens ca. 16 to 18, anthers ca. 2.5 mm long, 20- to 24-locellate; pistilloid ovaries ca. 1.5 mm long, glabrous; pistillate flowers: with bracteoles 1–1.5 mm long, calyx with 5 sepals, sepals ca. 2.5 mm diam. and corolla with 5 petals, only immature seen; ovary globose, ca. 2 mm diam., glabrous, style 3-parted. Fruit ovoid, 5.5–6.5 mm long, 5–6 mm diam., glabrous, with persistent styles ca. 4 mm long, apex 3-parted.

Distrbution and habitat. *Eurya luchunensis* occurs in a tropical broad-leaved secondary forest or montane rain forest, from 840 to 1900 m. So far the new species is only known from its type locality, on Mt. Huanglian-shan, Luchun County, southern

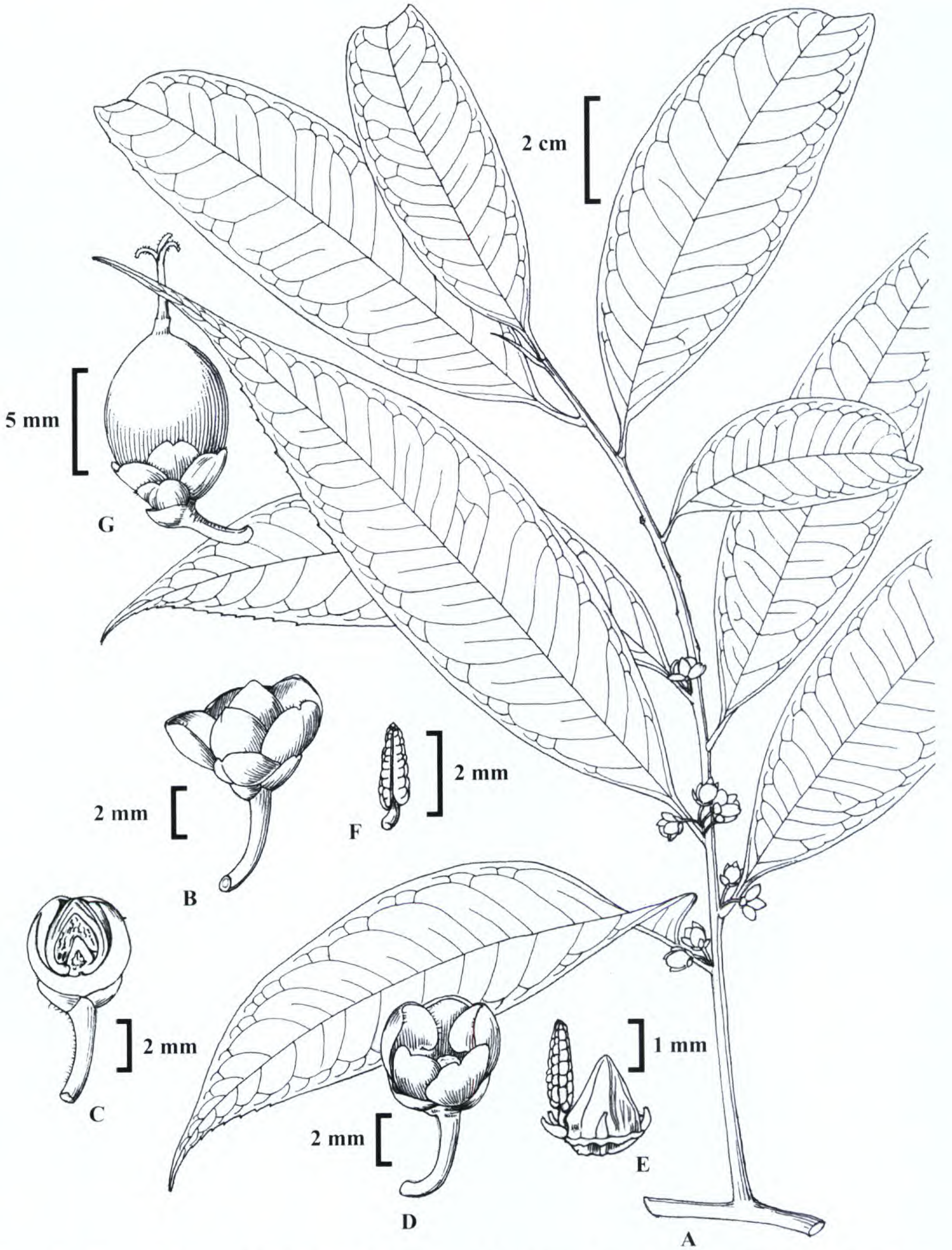

Figure 1. *Eurya luchunensis* J. H. Wang & H. Wang. —A. Flowering branch. —B. Pistillate or staminate flower, showing bracteoles, calyx, and corolla. —C. Detail of pistillate flower showing longitudinal section. —D. Pistillate or staminate flower, showing bracteoles and calyx. —E. Detail of degraded pistil and single stamen and filaments of other stamens with anthers removed. —F. Stamen. —G. Fruit. Drawn from the holotype, *D. D. Tao 1101* (KUN).

Yunnan, China. According to the collector's note, it is easy to find this species just above this area.

Phenology. Flowering middle October to early December, fruiting probably in later May (of the following year).

Paratypes. CHINA. **Yunnan Prov.:** Luchun County, Mt. Huanglian-shan, 1750 m, 5 Nov. 1974, *Luchun Exp. 690* (KUN); Mt. Huanglian-shan, 1700–1900 m, 15 Oct. 1995, *S. K. Wu et al. 049* (KUN); Mt. Huanglian-shan, 1700–1900 m, 19 Oct. 1995, *S. K. Wu et al. 548* (KUN); Mt. Huanglian-shan, 1700–1900 m, 23 Oct. 1995, *S. K. Wu et al. 648* (MO); Mt. Huanglian-shan, 840–1300 m, 30 Oct. 1995, *S. K. Wu et al. 2101* (KUN); Mt. Huanglian-shan, 1700–1900 m, 22 Oct. 1995, *S. K. Wu et al. 3208* (KUN).

Acknowledgments. We are indebted to Ming Tien-lu and Shu Zhi-yun (KUN) and Robert R. Mill (E) for their critical reading of the manuscript, and to the curator of the KUN herbarium, Kunming Institute of Botany, the Chinese Academy of Sciences, for enabling the study. We also thank Wu Xi-lin for preparing the illustration. This research was supported by a grant from the National Program for R & D Infrastructure and Facility Development (2004DKA30430).

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Validation of the Name *Ilex* ×*aquipernyi* J. B. Gable (Aquifoliaceae)

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ABSTRACT. *Ilex* ×*aquipernyi* J. B. Gable ex Whittemore (*Ilex aquifolium* × *I. pernyi*), a name that has been commonly used in the horticultural literature and the nursery trade for some 60 years, is validated here. It is known only from artificial crosses.

Key words: Aquifoliaceae, *Ilex*.

The genus *Ilex* L. (holly) consists of some 400 species of shrubs, native to all continents except Antarctica. Many species bear attractive red berries in fall and winter, tolerate a wide variety of soils, and are easy to propagate and grow, so hollies are cultivated frequently almost worldwide. Temperate evergreen species are particularly popular since some of them are very cold-tolerant; they can provide winter greenery in climates where few other evergreen plants will survive.

In the course of checking data for hollies at the National Arboretum, it was noted that a well-known name in widespread use in the holly literature, in general horticultural literature, and in the nursery trade, *Ilex* ×*aquipernyi*, has never been validly published. This name is validated and typified here.

Ilex ×**aquipernyi** J. B. Gable ex Whittemore, sp. nov. TYPE: U.S.A. District of Columbia: beside the parking lot, Holly-Magnolia Collection, U. S. National Arboretum, NA17762, 21 Apr. 2003, *A. T. Whittemore 03-005* (holotype, NA; isotypes, A, K, MOR, MO, TUS).

Hybrid formula: *Ilex aquifolium* L. × *Ilex pernyi* Franchet.

Frutex vel arbor sempervirens ad 6 m alta; ramuli hornotini glabri vel puberuli. Lamina lanceolata usque ovata vel elliptica, undulata, 31–63 mm longa, 14–35 mm lata, spinis grandibus, 2–4 in quoque margine. Flores 4-meri, fasciculati, pedicellis 2–3 mm longis.

Shrubs or small trees to 6 m tall; bark light gray-brown, rough but not fissured; twigs green or brown, 2–3.5 mm thick, glabrous or puberulent. Leaves evergreen; petiole 3–6 mm long, glabrous or puberulent; blade thick and rigid, glabrous (or base of midrib puberulent), lanceolate to ovate or elliptical, weakly to strongly undulate, 31–63 × 14–35 mm (excluding spines); upper surface shiny; base rounded to broadly obtuse or almost truncate; apex acuminate and spine-tipped; margins narrowly recurved, each side of leaf with 2 to 4 large triangular spine-tipped teeth up to 5 mm long. Flowers 4-merous, densely clustered in leaf axils on previous years' growth, pedicels 2–3 mm long, glabrous or puberulent, petals white. Berries red, spherical, 7–9 mm long, each with four pyrenes.

Illustrations. Figure 1; Galle (1952: plate III).

The name *Ilex* ×*aquipernyi* has a long history in the American nursery trade. Horticultural material grown under this name is descended from artificial crosses between *I. aquifolium* and *I. pernyi* made before 1940 by Joseph Benson Gable (1886–1972), a nurseryman of Stewartstown, Pennsylvania. Gable apparently distributed plant material labeled with the name "*Ilex* ×*aquipernyi*" for trial in the mid-1940s. The name has been in common use since that time, and appears in many standard horticultural references (Everett, 1981; Huxley et al., 1992; Meyer et al., 1994; Cullen et al., 1997; Galle, 1997; Dirr, 1998). Several cultivars are available in the trade (Dirr, 1998, lists six), and *I.* ×*aquipernyi* has been used as one parent in several crosses (Galle, 1997; Dirr, 1998). Despite this long history, the name has never been validly published, and has been in use as a *nomen nudum* for some 60 years.

The type specimen was taken from a plant of *Ilex* ×*aquipernyi* 'Aquipern', a cultivar Gable selected from seed that he obtained in 1933 from the cross *Ilex aquifolium* 'Pyramidalis' × *I. pernyi* (Anonymous, 1953). The cross is not known to occur spontaneously, though it might be expected where the two species are cultivated together.

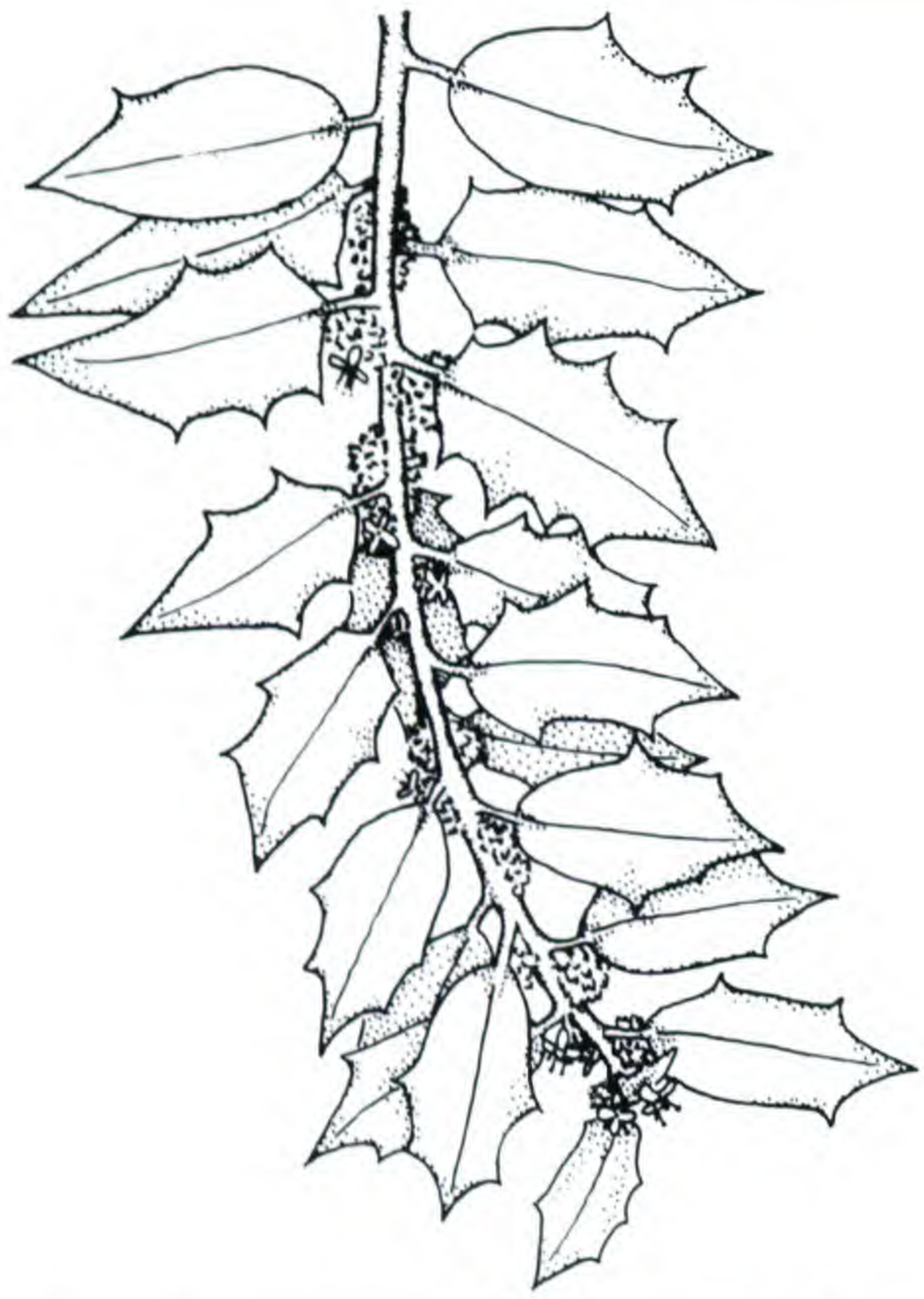

Figure 1. *Ilex ×aquipernyi* J. B. Gable ex Whittemore. —Flowering stem (*A. T. Whittemore 03-005*).

Acknowledgments. I thank Kevin Conrad for help locating information on these plants, John Wiersema and Dan Nicolson for comments on the manuscript, and Don Voss and Mark Roh for helpful discussions.

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Epigeneium gaoligongense (Orchidaceae), a New Species from Yunnan, China

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ABSTRACT. *Epigeneium gaoligongense* Hong Yu & Shi-Gang Zhang, a new species of Orchidaceae from Lushui County in western Yunnan, is described and illustrated. It is related to *Epigeneium rotundatum* (Lindley) Summerhayes, but differs from it by having smaller leaves 2.5–7 cm long, narrower petals 1.5–2 mm wide, a broadly ovate-orbicular lip with much larger lateral lobes, three indistinct keels and a callus on the disc, and a shorter column 4–5 mm long.

Key words: China, *Epigeneium*, Orchidaceae, Yunnan.

Epigeneium Gagnepain is an orchid genus of ca. 35 species, distributed in tropical and subtropical Asia. Seven species of this genus have been reported from China (Tsi, 1999). During a botanical trip by the authors to the Gaoligong Mountains in western Yunnan in autumn 2000, several plants of *Epigeneium* were collected from Lushui County at an altitude of nearly 2500 m, where no less than 20 individuals were found growing on rocks or tree trunks on the edge of a forest. They were brought back and cultivated in the greenhouse of the Inmol Laboratory of Biotechnology in Kunming and flowered early in August 2001. The species is similar in habit and to a lesser extent in floral structure to *Epigeneium rotundatum* (Lindley) Summerhayes, a species widely distributed from southwest China to India, Myanmar, and the Himalaya regions. From the latter it differs by having rather small leaves 2.5–7 cm long, narrower petals 1.5–2 mm wide, a broadly ovate-orbicular lip with much larger lateral lobes, three indistinct keels and a callus on the disc, and shorter column 4–5 mm long. We treat it here as a new species belonging to *Epigeneium* sect. *Katherinea* (A. D. Hawkes) Garay & G. A. Romero-Gonzalez, which is characterized by having two terminal leaves on each pseudobulb.

Epigeneium gaoligongense Hong Yu & S. G. Zhang, sp. nov. TYPE: China. Yunnan: Gaoligong Mt., Lushui County, alt. 2500 m, 26 Aug. 2001, *H. Yu & S. G. Zhang 101* (holotype, PE; isotype, Herbarium, Inmol Laboratory of Biotechnology, Kunming, Yunnan). Figure 1.

Pseudobulbi 3–9 cm distantes, anguste ovoidei vel cylindrico-ovoidei, 1.5–4 cm longi, 5–8 mm diam., apice bifolii. Folia ovato-elliptica vel elliptica, 2.5–7 × 1.2–2.8 cm. Scapus 2–3 cm longus, apice 1-florus; flos ca. 3 cm diam.; petala lineari-lanceolata, 15–21 × 1.5–2 mm; labellum ambitu late ovato-orbiculare, 1–1.5 × 1.4–2 cm; lobis lateralibus erecto-incurvis ovatis 11 × 6 mm, lobo intermedio late ovato 8–10 mm longo et lato, disco obscure 3-carinato et apice carinarum 1-calloso; columna 4–5 mm longa.

Epiphytic plants with an elongate, creeping rhizome 2–3 mm thick; rhizome usually branched, densely maroon-sheathed when young. Pseudobulbs 3–9 cm apart on the rhizome, enclosed by maroon sheaths when young, narrowly ovoid to cylindric-ovoid, 1.5–4 cm long, 5–8 mm thick, 2-leaved at apex. Leaves coriaceous, rigid, deep green above, pale green beneath, ovate-elliptic to elliptic, 2.5–7 × 1.2–2.8 cm, bifid at apex; petiole 5–11 mm long. Scape arising from the top of a rather young pseudobulb, 2–3 cm long, glabrous, with 2 or 3 maroon, lanceolate bracts at base, terminating in a single flower; flower ca. 3 cm across; sepals and petals pale green, usually with obscurely reddish purple markings dorsally; lip greenish color, densely red-purple-spotted; dorsal sepal lanceolate, 18–23 × 5–6 mm, obscurely 5-nerved; lateral sepals obliquely lanceolate-ovate, 15–19 × 9–10 mm, obscurely 7-nerved; petals linear-lanceolate, 15–21 × 1.5–2 mm, 1-nerved; lip adnate at base to the top of the column foot, broadly ovate-orbicular in outline, trilobed, 1–1.5 × 1.4–2 cm; lateral lobes erect-incurved, ovate, ca. 11 6 mm; mid-lobe broadly ovate, 8–10 mm long and wide, acute at apex; disc with 3 indistinct keels and at their top

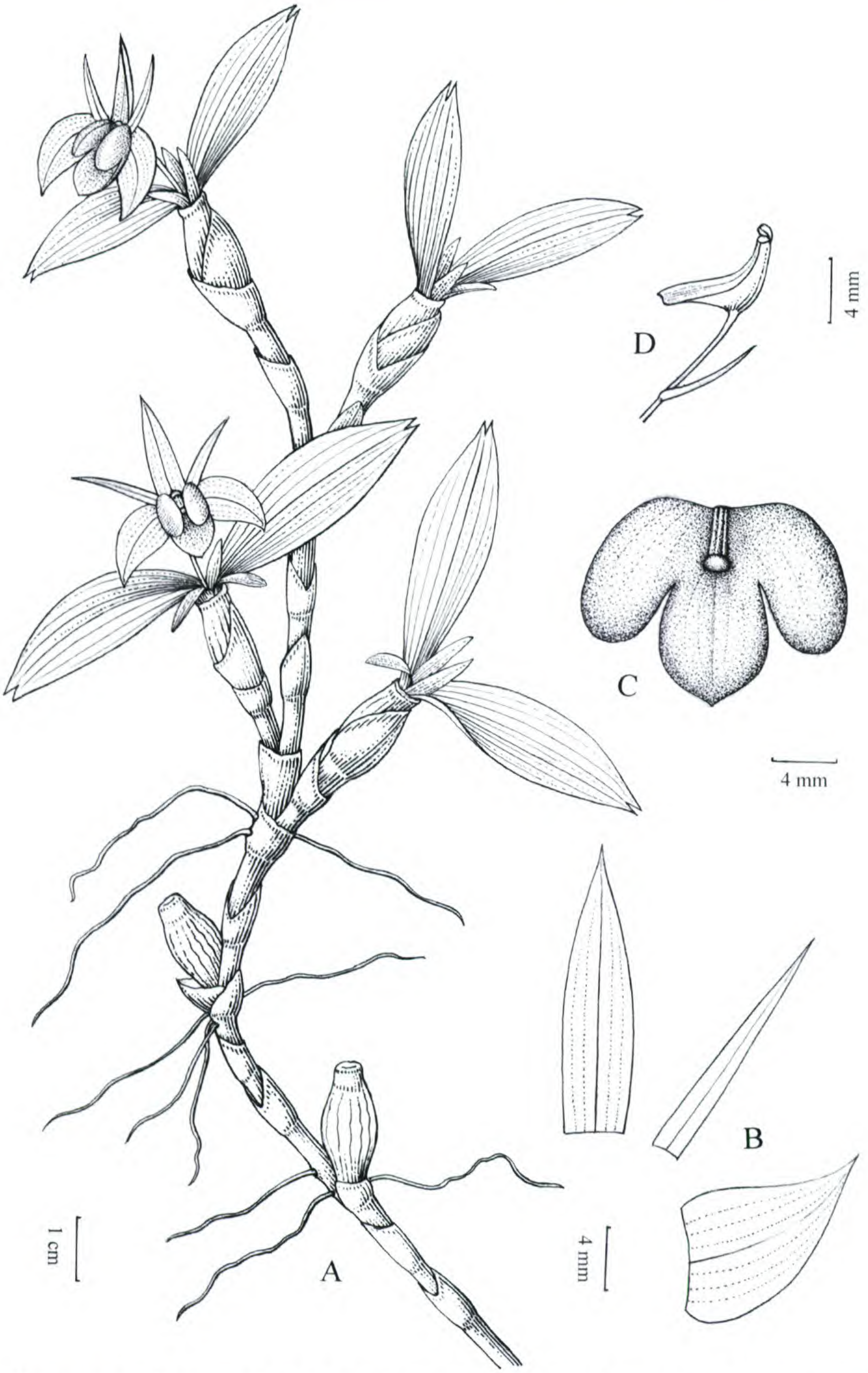

Figure 1. *Epigeneium gaoligongense* Hong Yu & S. G. Zhang. —A. Plant. —B. Dorsal sepal, lateral sepal, and petal, front view. —C. Lip, front view. —D. Column and column-foot, side view. Drawn from the type specimen, *Yu & Zhang 101*.

a red-purple callus; column stout, 4–5 mm long and wide, base with a foot 5–7 mm long.

Artificial Key to Chinese Species of *Epigeneium*

1a. Pseudobulbs with 1 leaf at apex.
  2a. Lip rounded, apiculate or slightly emarginate at apex . . . . . *E. nakaharaei* (Schlechter) Summerhayes
  2b. Lip conspicuously bilobed at apex.
    3a. Leaves ovate or broadly ovate, 1–2.3 cm long; lip oblong-obovate, with its mid-lobe deeply bilobed at apex . . *E. fargesii* (Finet) Gagnepain
    3b. Leaves often obovate or obovate-elliptic, 2.5–4.7 cm long, lip pandurate, with its mid-lobe emarginated at apex . . . . . *E. clemensiae* Gagnepain
1b. Pseudobulbs with 2 leaves at apex.
  4a. Lip with three indistinct keels and a callus on the disc . . . . . *E. gaoligongense* Hong Yu & S. G. Zhang
  4b. Lip with 2 or 3 fleshy lamellae on the disc.
    5a. Petals narrowly lanceolate or narrowly oblong, less than 4 mm wide.
      6a. Labellum without a claw at base; mid-lobe hooked-aristate at apex . . *E. fuscescens* (Griffith) Summerhayes
      6b. Labellum with a distinct claw at base; mid-lobe apiculate at apex . . . . . *E. yunnanense* T. Tang & Z. H. Tsi
    5b. Petals lanceolate or oblong-lanceolate, more than 5 mm wide.
      7a. Sepals ca. 4.5 cm long; mid-lobe of labellum sub rhombic . . . *E. amplum* (Lindley) Summerhayes
      7b. Sepals 2.2–2.5 cm long; mid-lobe of labellum subreniform or nearly orbicular . . . *E. rotundatum* (Lindley) Summerhayes

Distribution. This new species is known only from the type locality in Yunnan, China, where it is rather common growing on rocks or tree trunks on the edges of forests.

Acknowledgments. The authors express their sincere thanks to S. C. Chen for his kindly correcting the manuscript and to S. Q. Cai and Q. H. Huang for preparing the drawing of this new species.

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Carex capilliculmis (Cyperaceae), a New Name for *Carex filamentosa*

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ABSTRACT. The new name *Carex capilliculmis* S. R. Zhang is proposed to replace the later homonym *Carex filamentosa* K. T. Fu. *Carex capilliculmis* belongs to section *Digitatae* and is found in western China.

Key words: *Carex capilliculmis*, *Carex filamentosa*, China, Cyperaceae.

While preparing the taxonomic treatment of the genus *Carex* (Cyperaceae) for the *Flora of China*, the author found that *Carex filamentosa* K. T. Fu was an illegitimate later homonym, and a new name was necessary for the species. *Carex filamentosa* K. T. Fu was published in volume 1(1) of the *Flora Tsinlingensis* (Anonymous, 1976) and has been accepted by other Chinese botanists (Dai et al., 2003; Li, 1994, 2000). According to the protologue, this species is closely related to *C. lanceolata* Boott. It differs, however, in its more slender culms (ca. 0.5 mm wide), very distant spikes, leafy bracts with short blades (to 5 cm) and long sheaths (to 3 cm), a long and filiform peduncle of the lowest spike, and smaller glumes (3–4 mm), and should be recognized as a distinct species. In *C. lanceolata*, the spikes are relatively congested, the bracts are spathe-like with or without setaceous blades at the top and with short sheaths (ca. 1 cm), and longer glumes (5–6 mm). *Carex filamentosa* K. T. Fu is distributed in western China from Gansu, Qinghai, Shaanxi, Sichuan, and Yunnan, whereas *C. lanceolata* is found in Anhui, Gansu, Guizhou, Hebei, Heilongjiang, Henan, Jiangsu, Jiangxi, Jilin, Liaoning, Nei Mongol, Shaanxi, Shandong, Shanxi, Sichuan, Yunnan, and Zhejiang (Li, 2000). The distributions of the two species overlap in Gansu, Shaanxi, Sichuan, and Yunnan in China.

Unfortunately, the name *Carex filamentosa* was previously published by Petrie (1916). The homonym *Carex filamentosa* K. T. Fu (1976) belongs to section *Digitatae* (Fries) Christ (Bull. Soc. Bot. Belg. 24(2): 13. 1885), which is distributed in Europe, temperate Asia, and temperate North America (Egorova, 1999), while the earlier name *C. filamentosa* Petrie belongs to a rather different section *Echinochlaenae* T. Holm (Amer. J. Sci. 16: 462. 1903), which is distributed in Australia, New Zealand, and South America (Kükenthal, 1909). The species *Carex filamentosa* Petrie is endemic to New Zealand and recognized in the *Flora of New Zealand*, volume 3 (Healy & Edgar, 1980). Thus, the name *Carex filamentosa* K. T. Fu is an illegitimate later homonym, and should be replaced by a new name. Here, *Carex capilliculmis* S. R. Zhang is proposed to replace *C. filamentosa* K. T. Fu.

Carex capilliculmis S. R. Zhang, nom. nov. Replaced name: *Carex filamentosa* K. T. Fu, Fl. Tsinling. 1(1): 254, fig. 221. 1976, non Petrie, Trans. & Proc. New Zealand Inst. 1915 (48): 191. 1916. TYPE: China. Shaanxi: Ping-an Temple, Mt. Taibai, on slopes, 2850 m, 12 June 1959, *J. X. Yang 907* (holotype, WUK not seen; isotype, PE).

Distribution and habitat. China (Gansu, Qinghai, Shaanxi, Sichuan, and Yunnan; the distribution in Yunnan was recorded by Li, 1994, 2000). In forests, among thickets, on rocky cliffs, slopes, and alpine meadows; 1100–4350 m.

Pin-Yin name. Si gan tai cao.

Specimens examined. CHINA. **Gansu:** Jonê, *Tao River Expedition 3256* (PE). **Qinghai:** Haiyan, *P. C. Tsoong 8352, 8391* (PE). **Shaanxi:** Mt. Taibai, Ping-an Temple, *J. X. Yang 907* (PE). **Sichuan:** Dawu, *S. Jiang 9652* (PE); Jiulong, *C. T. Kuan 270211* (PE); Kangding, *K. L. Chü 7032* (PE); Yajiang, *Anonymous 5453* (PE), *C. T. Kuan 510158* (PE).

Because its terminal spike is staminate, its lateral spikes are pistillate, and its utricles are pubescent with tapered bases and short beaks, *Carex capilliculmis* belongs to section *Digitatae* (Fries) Christ. The species also resembles *C. cardiolepis* Nees and *C. crebra* V. Kreczetowicz of the same section. *Carex cardiolepis* is distributed in Qinghai, Sichuan, Tibet, and Yunnan in China, and also in the Himalayas, Kashmir, and Afghanistan, while *C. crebra* is found only in Gansu, Qinghai, Sichuan, Tibet, and Yunnan in China (Li, 2000). These three

species together with *C. lanceolata* can be distinguished with the following key.

KEY TO *CAREX CAPILLICULMIS* AND RELATED SPECIES IN CHINA

1a. Bracts spathe-like, sheaths short and loosely embracing culms, without blades or only the lowest one with setaceous blade.
  2a. Leaf blades flat, margins not involute; pistillate glumes 5–6 mm; utricles much shorter than glumes, ca. 3 mm . . . . . *Carex lanceolata* Boott
  2b. Leaf blades filiform, margins involute; pistillate glumes 4.5–5 mm; utricles slightly shorter than glumes, 3.5–4.5 mm . . . . . *Carex crebra* V. Kreczetowicz
1b. Bracts leafy, sheaths long and tightly embracing culms, with short leafy blades.
  3a. Culms ca. 1 mm wide; spikes larger, staminate one 15–20 × 2–2.5 mm, pistillate ones 10–20 × 3 mm, with many pistillate flowers; pistillate glumes more than 4 mm; utricles not longer than glumes, with 2 lateral keels and several fine veins . . . . . *Carex cardiolepis* Nees
  3b. Culms ca. 0.5 mm wide; spikes smaller, staminate one 7–10 × 1.5–2 mm, pistillate ones 7–10 × 2–3 mm, with few pistillate flowers; pistillate glumes less than 4 mm; utricles slightly longer than glumes, only with 2 lateral keels and no fine venation . . . . . *Carex capilliculmis* S. R. Zhang

Acknowledgments. The author appreciates the valuable comments on the manuscript by anonymous reviewers. This study was supported by a grant (grant number 30370104) from the National Natural Science Foundation of China.

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Lectotypification of the Chinese Species *Stachyurus yunnanensis* and the Identity of *S. callosus* (Stachyuraceae)

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ABSTRACT. The Chinese endemic *Stachyurus yunnanensis* Franchet is lectotypified. *Stachyurus callosus* C. Y. Wu ex S. K. Chen, also endemic to China, is referred to synonymy of *S. yunnanensis* based on the two entities having inseparable leaf characters and a sympatric distribution. *Stachyurus esquirolii* H. Léveillé is regarded as a synonym of *S. yunnanensis*, as in Li's and Lauener's previous treatments of this taxon.

Key words: China, Stachyuraceae, *Stachyurus*, Yunnan.

Stachyurus yunnanensis Franchet was first described by Franchet (1898) from three collections from Yunnan and Sichuan provinces of China. In the protologue, the characters of the flowers and especially the leaves of this species were described; leaf characters, e.g., leaf shape and margin serration, were emphasized to distinguish *S. yunnanensis* from *S. praecox* Siebold & Zuccarini. No holotype was designated by Franchet, but he did cite three specimens, which are therefore syntypes (ICBN Art. 9.4, Greuter et al., 2000). *J. M. Delavay 822*, *J. M. Delavay 3334*, and *P. Farges 1156* are preserved at P. Up to now no lectotype has been designated, as far as we could trace. According to Articles 9.9 and 9.10 of the ICBN, a lectotype may be designated for *S. yunnanensis* and, under the circumstances, it must be one of the syntypes. The specimen *J. M. Delavay 822* (P) is the most complete, a beautiful specimen with ovate-oblong to ovate-lanceolate, leathery leaves, with serration at the margins, and racemes with dense, subsessile, yellow flowers. It best corresponds with the diagnosis of *S. yunnanensis*, and it agrees with the species as currently understood.

Stachyurus yunnanensis Franchet, J. Bot. (Morot) 12: 253. 1898. TYPE: China. Yunnan: Mosuoying, 23 Apr. 1883, *Delavay 822* (lectotype, designated here, P)

Stachyurus esquirolii H. Léveillé, Fl. Kouy-Tchéou. 416. 1915. TYPE: China. Guizhou: 1700 m, 20 Mar. 1912, *J. Esquirol 3517* (holotype, E).

Stachyurus callosus C. Y. Wu ex S. K. Chen, Acta Bot. Yunnan. 3: 128. 1981. Syn. nov. TYPE: China. Yunnan: Malipo, 20 Jan. 1940, *C. W. Wang 86275* (holotype, KUN; isotype, PE).

Specimens examined. CHINA. **Yunnan:** Pingbian, 26 Oct. 1954, *K. M. Feng 5175* (KUN, PE).

Habitat and distribution. Stachyurus yunnanensis is an evergreen shrub that is narrowly distributed in China from northeastern and southeastern Yunnan to Guangdong provinces, via Sichuan, Guizhou, Hubei, and Hunan provinces; it usually grows in calcareous forests between 650 and 1950 m.

Stachyurus esquirolii H. Léveillé was first published by H. Léveillé (1914) based on one collection, *J. Esquirol 3517* (E), but it was not recognized by later workers. Li (1943) and Lauener (1966) treated it as a synonym of *S. yunnanensis*. After examining *J. Esquirol 3517*, we found its morphological features, such as persistent, ovate-oblong to ovate-lanceolate, leathery leaves, distinct serration, and 5–9 cm long inflorescences with yellow flowers, are consistent with those of *S. yunnanensis*. We therefore agree with Li's (1943) and Lauener's (1966) treatments of it.

Stachyurus callosus C. Y. Wu ex S. K. Chen was first described based on the holotype collection *C. W. Wang 86275* (Chen, 1981). The protologue indicated that this species was close to *S. yunnanensis* but differed only in having elliptic or oblong-elliptic leaves with irregular and straight teeth. *Stachyurus callosus* has been traditionally recognized as a species by taxonomists since its 1981 publication (Chen, 1983; Tang et al., 1983; Shan, 1999). After examining numerous specimens of *Stachyurus* and conducting a field expedition to Sichuan and Yunnan provinces of China, we found a continuous variation in the leaf blades of *S. yunnanensis*. For example, in this species, leaves are leathery or thickly papery, ovate-oblong, oblong-elliptic, or ovate-lanceolate, with either regular or irregular serration at the margins. Even different

leaves on the same plant of *S. yunnanensis* may have variable teeth. The characters of *S. callosus* are within the range of that of *S. yunnanensis*. Therefore, it is effectively impossible to distinguish between *S. callosus* and *S. yunnanensis* based solely on morphological characters.

Stachyurus callosus is distributed only in Malipo and Pingbian Counties of southeastern Yunnan (based on two specimens), at an altitude of 900–1100 m, falling just within the geographic distribution of *S. yunnanensis*. In addition, both species grow in calcareous forests (Chen, 1981). On the basis of these data, we believe that *Stachyurus callosus* should be treated as a synonym of *S. yunnanensis*.

Acknowledgments. We are most grateful to the curators of BM, E, K, KUN, P, and PE for the loan of or permission to examine specimens, and to Tang Yancheng (PE), John McNeill (E), and Zhu Guanghua (MO) for valuable information and suggestions on the manuscript. This project is supported by a grant from the National Natural Science Foundation of China (NSFC No. 30130030).

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Volume 15, Number 3, pp. 385–502 of NOVON was published on 21 September 2005.

Volume 15
Number 4
2005

NOVON

New Taxa and New Combinations in Some Mexican and Central American Melastomataceae

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ABSTRACT. Diagnoses, descriptions, and illustrations are presented for four new taxa of *Miconia* (*M. commutata* from Costa Rica and Panama, *M. danielii* and *M. tonduzii* var. *hirtella* from Costa Rica, and *M. dissita* from Panama). Three new combinations (*Miconia chinantlana* (Naudin) Almeda for *Staphidium chinantlanum* Naudin; *Miconia lundellii* (Wurdack) Almeda for *Clidemia lundellii* Wurdack; and *Tibouchina tortuosa* (Bonpland) Almeda for *Rhexia tortuosa* Bonpland) are proposed. *Miconia tonduzii* Cogniaux is neotypified and its infraspecific taxonomy is revised to include three varieties. *Miconia sparrei* Wurdack, which was described from Amazonian Ecuador and heretofore known only from the holotype, is redescribed, illustrated, and reported from the Caribbean lowlands of Costa Rica and from Peru. Citations of representative specimens, distributional and phenological notes, and comparisons with probable relatives are provided for each taxon.

Key words: Central America, Melastomataceae, Mexico, *Miconia*, Neotropics, *Tibouchina*.

This paper presents miscellaneous descriptions of new taxa, new combinations, a neotypification, and new distributional records for selected species in the genera *Miconia* Ruiz & Pavon and *Tibouchina* Aublet. It represents what I hope will be one of the last precursors to the accounts of the Melastomataceae for *Flora Mesoamericana* and the *Manual de Plantas de Costa Rica*. Work on a family like the Melastomataceae, which has radiated extensively in the wet tropics, is a challenging and unending synthesis. The floristic accounts mentioned above will be the first comprehensive accounts of the family for the region covered based on extensive fieldwork by a specialist and collaborators. I see these treatments as progress reports that will provide the crucial basis for identifying collections and as compendia that will stimulate additional exploration and research to deepen our understanding of one of the more commonly encountered families of vascular plants in the Neotropics.

Miconia chinantlana (Naudin) Almeda, comb. nov. Basionym: *Staphidium chinantlanum* Naudin, Ann. Sci. Nat. Bot. 3, 17: 318. 1851. *Clidemia chinantlana* (Naudin) Triana, Trans. Linn. Soc. London 28: 135. 1871. TYPE: Mexico. Oaxaca: Chinantla, Jocotepeque, 1000 m, 1840, *H. G. Galeotti 2945* (holotype, P; isotype, BR).

Miconia echinoidea Standley & Steyermark, Field Mus. Nat. Hist., Bot. Ser. 23: 180. 1944. Syn. nov. TYPE: Guatemala. Huehuetenango: vicinity of Maxbal, about 17 miles N of Barrillas, Sierra de los Cuchumatanes, *J. Steyermark 48831* (holotype, F).

Section *Octomeris*. Shrub 1.5–4 m tall, the uppermost terete cauline internodes, petioles, abaxial leaf surfaces, inflorescence rachis, hypanthia, calyx lobes, and exterior calyx teeth copiously covered with yellowish spreading stalked-stellate hairs. Leaves of a pair ± equal to unequal in size; petioles 0.6–4.8 cm long; blades 9.7–20 × 4–9.5 cm, ovate to lance-ovate, 5- to 7-plinerved with the innermost pair of primary veins diverging from the midvein in opposite or subalternate fashion 0.5–1.7

cm above the blade base, apex long acuminate, base obtuse to broadly rounded and commonly oblique, the margin inconspicuously ciliate-serrulate to nearly entire, the adaxial surface copiously covered with smooth spreading apically curved hairs 0.25–0.5 mm long. Inflorescence a terminal paniculiform dichasium 4–9 cm long with ultimate branchlets terminating in simple 3-flowered dichasia, flowers 5-merous, essentially sessile at anthesis with pedicels to 0.5–1 mm in fruit; bracts and bracteoles 1–2 × 0.25–0.4 mm, deciduous, subulate to elliptic, adaxial surface glabrous, abaxial surface beset with stalked-stellate hairs, the margin ciliate and terminating in a smooth hair. Hypanthial indument typically not concealing the actual surface at anthesis; calyx tube 0.25 mm long, the calyx lobes 2–3 mm long, and conspicuously exceeding the calyx lobes in length, ovate-rounded to ovate-oblong, the exterior calyx teeth stoutly subulate; petals 3–5 × 1.75–2 mm, glabrous, oblong-obovate and reflexed at anthesis; stamens 10, isomorphic; filaments 2–3.5 mm long, glabrous; anthers 3–3.5 mm long, yellow, linear-oblong with a ventrally inclined apical pore; connective thickened dorsally but neither prolonged nor appendaged; ovary 5-locular, ⅔ inferior, apex of fruiting hypanthia truncate and glabrous around the stylar scar but glandular-puberulent in a wide ring around the style; style 8 mm long, straight, sparsely beset with minute stellate and glandular hairs; stigma punctiform. Berry 6–7 × 6–7 mm when dry, purple-black when mature; seeds 0.75–1 mm long, ovoid, the testa vaguely rugulate.

Phenology. Flowering collections have been made from May through July; fruiting from August through November.

Distribution. Local and uncommon in rain forests and pine-oak-*Liquidambar* L. forests from southeastern Mexico (Chiapas and Oaxaca) to western Guatemala (Huehuetenango) at 1250–1900 m.

Miconia chinantlana is here assigned to section *Octomeris* Triana based on its elongate subulate anthers and regularly lobed calyx. Most recently collected material of this species has been identified as *Miconia echinoidea* Standley & Steyermark, the type of which is identical to the type of *Staphidium chinantlanum*, the oldest available specific epithet for this species. *Miconia chinantlana* is very close to and readily confused with *Miconia globulifera* Naudin, which also occurs in southeastern Mexico (Chiapas, Oaxaca, and Veracruz) and Guatemala. These two species are similar in habit, foliar shape, venation and indument, and in having 5-merous flowers and a 5-locular ovary. *Miconia globulifera* differs in having the flowers aggregated in capitate clusters of more than three flowers at the ends of the inflorescence branchlets, the calyx teeth are 0.5–1 mm long and barely exceeding the calyx lobes in length, the hypanthia are beset with simple and apically bifid hairs 1–1.5 mm long that conceal the actual surface at anthesis, and the style is essentially glabrous.

Representative specimens examined. MEXICO. **Chiapas:** Mun. Cintalapa, SE of Cerro Baul on the border w/ Oaxaca, 16 km NW of Rizo de Oro along a logging road to Colonia Figaroa, *Breedlove 27619* (DS); Mun. Jitotol, 5 km SE of Jitotol along road to Bochil, *Breedlove 52655* (CAS); Mun. Yajalón, camino la punta del Cerro Ventana, *Méndez Ton 6687* (CAS); Rancho Concepción (Adelante Caté Simojobel), *Miranda 6694* (CAS). **Oaxaca:** Mun. Totontepec, Distr. Mixe, Rancho La Garrapata, 6 km al E de Totontepec, *Ramirez & Ramirez 404* (CAS); Mun. Totontepec, Distr. Mixe, Totontepec, *Rivera 1490* (CAS); Distr. of Choapam, Cerro Lalana, *Schultes & Reko 856* (CAS, MEXU).

Miconia commutata Almeda, sp. nov. TYPE: Costa Rica. Heredia: Finca La Selva, OTS Field Station, Río Puerto Viejo, just E of jct. w/Río Sarapiquí, along Q. La Selva, 2800 m S × 700 m E, 22 Feb. 1982 (fl), *B. Hammel 11237* (holotype, CAS; isotype, DUKE). Figure 1.

Section *Miconia.* Arbor 4–15 m; ramuli primum quadrangulati vel sulcato-quadrangulati demum teretes sicut petioli inflorescentia venae primariae subtus hypanthiaque indumento appresso amorpho-squamato induti. Lamina 15–31 × 6.3–12.8 cm oblongo-elliptica 3- ad 5-nervata, supra glabra. Panicula 10–28 cm multiflora; flores 5-meri, calycis tubus 0.5 mm altus, lobis interioribus 0.5 mm altis, dentibus exterioribus subobsoletis vel obscurissimis; fructum calyces decidui; stamina paullulo dimorphica glabra; antherarum thecae 2.5 mm anguste oblongae poro ventraliter inclinato, connectivo vix (0.5 mm) prolongato dorsaliter vel antherarum thecae 2.25 mm anguste oblongae poro truncato, connectivo vix (0.25 mm) prolongato dorsaliter ad basim bilobulato ornatis; ovarium 3-loculare et ⅔ inferum apice glabro.

Tree 4–15 m tall, the quadrate to quadrisulcate uppermost cauline internodes, young petioles, inflorescence branches, pedicels, hypanthia, and calyx teeth moderately to densely covered with an appressed lepidote or bran-like indument. Leaves of a pair equal to subequal; petioles (2.5–)4–7.5 cm long, the blade 15–31 × 6.3–12.8 cm, 3- to 5-nerved with an additional inconspicuous intramarginal pair, oblong-elliptic, the apex caudate-acuminate, the base obtuse to rounded, the margin entire, the adaxial surface glabrous, the abaxial surface with a sparse deciduous lepidote or bran-like indument on the elevated primary veins but essentially glabrous on the actual surface. Inflores-

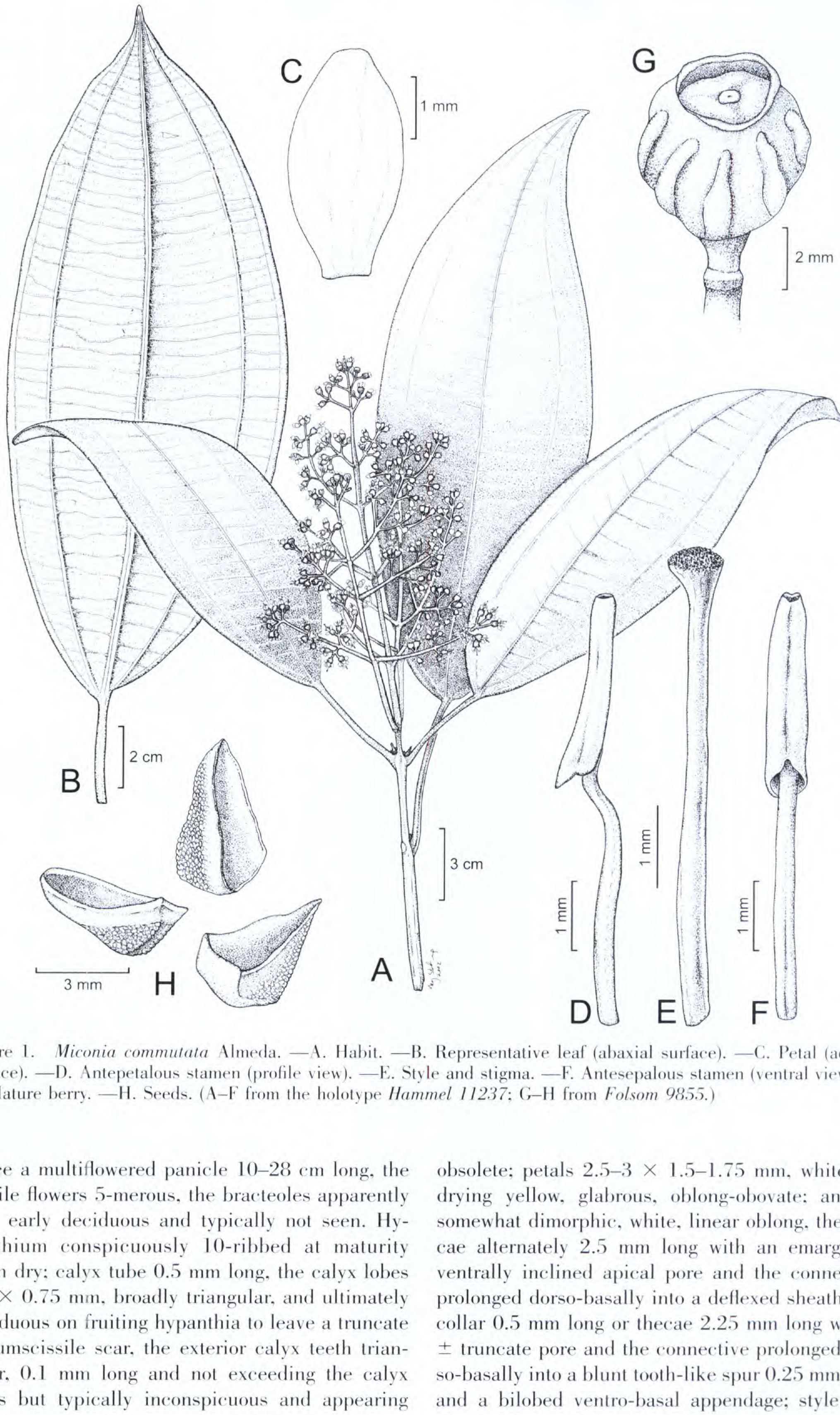


Figure 1. *Miconia commutata* Almeda. —A. Habit. —B. Representative leaf (abaxial surface). —C. Petal (adaxial surface). —D. Antepetalous stamen (profile view). —E. Style and stigma. —F. Antesepalous stamen (ventral view). —G. Mature berry. —H. Seeds. (A–F from the holotype *Hammel 11237*; G–H from *Folsom 9855*.)

cence a multiflowered panicle 10–28 cm long, the sessile flowers 5-merous, the bracteoles apparently very early deciduous and typically not seen. Hypanthium conspicuously 10-ribbed at maturity when dry; calyx tube 0.5 mm long, the calyx lobes 0.5 × 0.75 mm, broadly triangular, and ultimately deciduous on fruiting hypanthia to leave a truncate circumscissile scar, the exterior calyx teeth triangular, 0.1 mm long and not exceeding the calyx lobes but typically inconspicuous and appearing obsolete; petals 2.5–3 × 1.5–1.75 mm, white but drying yellow, glabrous, oblong-obovate; anthers somewhat dimorphic, white, linear oblong, the thecae alternately 2.5 mm long with an emarginate ventrally inclined apical pore and the connective prolonged dorso-basally into a deflexed sheath-like collar 0.5 mm long or thecae 2.25 mm long with a ± truncate pore and the connective prolonged dorso-basally into a blunt tooth-like spur 0.25 mm long and a bilobed ventro-basal appendage; style 5–7

mm long, glabrous; stigma clavate-truncate; ovary 3-locular, ⅔ inferior, the apex glabrous and rounded. Berry 5–6 × 5–6 mm when dry, 10-ribbed, turning from green through yellow, red, and ultimately purple-black at maturity; seeds 1–1.5 mm long, ± triangular in outline with a raphe that is expanded into a somewhat compressed elevated border, the glossy testa with minute but distinct verruculose angles on the convex face.

Phenology. Flowering collections have been made in February and March; fruiting specimens have been collected from February through May.

Distribution. Local and uncommon in lowland rain forest and swamp forest (0–120 m elevation) at the OTS Field Station along the Río Puerto Viejo on the Caribbean slope of Costa Rica and in the vicinity of Changuinola on the Caribbean versant in northwestern Panama.

Miconia commutata is assigned to section *Miconia* based on its slightly attenuate anthers and dorsally appendaged anther connective. It is characterized by its large entire leaf blades, long petioles, circumscissile calyx that falls away as a ring, anther connectives that are modified dorso-basally into a spur or sheath-like collar, 10-ribbed berries, and more or less triangular seeds with a raphe that forms a somewhat compressed elevated border. *Miconia commutata* is most similar to *M. smaragdina* Naudin in indument details and in the circumscissile nature of the calyx. The latter differs in having narrower leaf blades (2.7–8.5 cm) that are somewhat decurrent on the shorter (0.5–1.9 cm) petioles, petals that are minutely granulose-papillose (especially on the adaxial surface), anther connectives that are prolonged ventro-basally into a bilobed appendage with each lobe appressed to the base of each anther sac, and a capitate stigma. These two species also exhibit distinctive distributional and elevational differences. *Miconia commutata* appears to be restricted to low elevations (0–120 m) in Costa Rica and Panama, whereas *M. smaragdina* occurs at higher elevations (450)850–1500 m from southern Mexico disjunctly through Central America to Colombia, Venezuela, and Ecuador (Almeda, unpubl.).

Among South American species, *M. commutata* is superficially like *M. rivalis* Wurdack of Ecuador, which also has large leaf blades and a multiflowered inflorescence. The leaf blades of *M. rivalis*, however, are undulate-serrulate, the tardily deciduous indument on the inflorescence and hypanthia is appressed subamorphous-stellulate, the calyx lobes are persistent, and the anther pores are uniformly ventrally inclined.

The flowers of this species reportedly (fide *Hammel 11237*) have a very strong cinnamon-like or rose-cinnamon fragrance.

Etymology. The specific epithet is derived from the Latin word *commutata*, meaning changing or changed, in reference to the changing color of berries from green to yellow, then red, and ultimately purple-black at maturity.

Paratypes. COSTA RICA. **Heredia:** Finca La Selva, OTS Field Station on the Río Puerto Viejo just E of jct. w/Río Sarapiquí Central Trail, 2400 m line, *Folsom 9467* (CAS, DUKE), Southwest Trail, 1400–1600 m line, *Folsom 9697* (CAS, DUKE), El Swampo Trail, *Folsom 9767* (CAS, DUKE), Central Trail, 2600 m line/W Boundary, 3000 m line, *Folsom 9855* (CAS, DUKE); OTS Field Station, S Boundary, along Q. El Salto, *Hammel 7940* (CAS, DUKE); OTS Field Station, W Boundary 1800 m S, swampy area, *Hammel 12566* (CAS, DUKE). **Puntarenas:** Península de Osa, Bosque communal La Gloria, a orillas de Río Claro, *Cordero 277* (CR, INB, MO). PANAMA. **Bocas del Toro:** a orillas del Changuinola y bosque alrededor de la escuela de Corriente Grande, *Correa et al. 4014* (CAS, PMA).

Miconia danielii Almeda, sp. nov. TYPE: Costa Rica. Cartago: 4–6 km N of Trinidad on S-facing slopes of Volcán Turrialba, 4 July 1977, *F. Almeda, R. L. Wilbur & T. F. Daniel 2876* (holotype, CAS; isotype, CR). Figure 2.

Section *Cremanium.* Frutex 1.5–3.5 m; ramuli primum obtuse sulcato-quadrangulati demum teretes sicut petioli foliorum subtus venae primariae et secundariae hypanthiaque modice vel dense pilis dendriticis et lepidotis induti. Lamina 11.5–20 × 6–10.5 cm elliptico-ovata, 5-nervata, supra glabra. Panicula 8–15 cm multiflora, flores 5-meri, calycis tubus 0.25 mm altus, lobis interioribus 0.5–0.75 mm altis, dentibus exterioribus crassis appressis inframarginalibus. Stamina isomorphica glabra, antherarum thecae 1–1.5 mm oblongae latae 4-porosae, poro ventraliter inclinato; connectivum ad basim ventraliter paulo (0.1 mm) bilobulato-prolongatum dorsaliter dente 0.5 mm longo armatum. Ovarium 3-loculare et ½ inferum apice glabro.

Shrub 1.5–3.5 m tall, the rounded-quadrate to quadrisulcate upper internodes, young petioles, primary and higher order veins on abaxial foliar surfaces, and inflorescence branches moderately to densely covered with lepidote and ± flattened dendritic hairs. Leaves of a pair essentially equal in size; petioles 3.3–4.5 cm long, blades 11.5–20 × 6–10.5 cm, 5-nerved, elliptic-ovate, the apex acuminate to caudate-acuminate, the base obtuse to rounded, the margin conspicuously serrulate, the adaxial surface essentially glabrous at maturity. Inflorescence a multiflowered panicle 8–15 cm long, the 5-merous flowers on pedicels 1–1.5 mm long, the bracteoles 2.5–4.5 × 0.75–1 mm, oblong to elliptic-oblong, early-deciduous. Hypanthium spar-

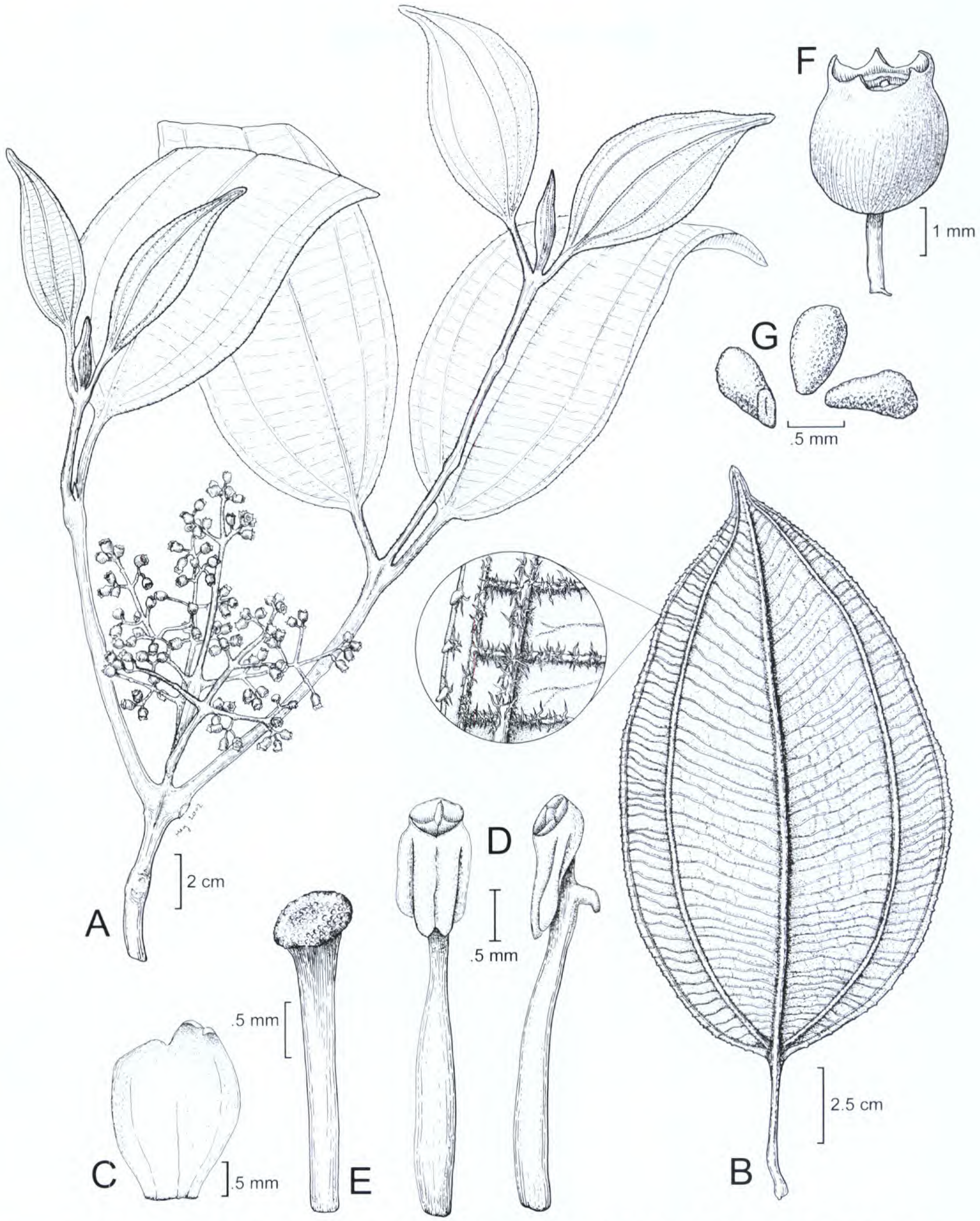


Figure 2. *Miconia danielii* Almeda. —A. Habit. —B. Representative leaf (abaxial surface). —C. Petal (adaxial surface). —D. Stamens, ventral view (left) and profile view (right). —E. Style and stigma. —F. Berry. —G. Seeds. (A, B, F from *Almeda et al. 2883*; C–E from *Utley & Utley 2466*; G from the holotype *Almeda et al. 2876*.)

ingly scurfy-puberulent at the base to essentially glabrous throughout; calyx tube 0.25 mm long, the calyx lobes 0.5–0.75 × 1 mm, broadly rounded; the exterior calyx teeth bluntly conic, 0.25 mm long, shorter than the calyx lobes; petals 1.5 × 1.5–2 mm, white, glabrous, obovate to suborbicular; anthers isomorphic, 1–1.5 mm long, white, obovoid-oblong, 4-celled with 4 pores that are somewhat ventrally inclined; connective thickened dorsally and prolonged dorso-basally into a deflexed cau-

diform appendage 0.5 mm long and also prolonged ventro-basally at the base of each anther sac into a deflexed lobule 0.1 mm long; style 3–3.5 mm long, glabrous; stigma peltate; ovary 3-locular, ½ inferior, the apex glabrous. Berry 3 × 4–5 mm when dry; seeds 0.5 mm long, narrowly ovoid, the testa vaguely granulate.

Phenology. Collected in flower from March through May and July; in fruit in July and in December.

Distribution. Endemic to Costa Rica, where it is local and uncommon in cloud forests, forest margins, stream banks, and montane pastures on the Cordillera Central (Volcán Barva and Volcán Turrialba), Valle de Reventazón, and the Cordillera de Talamanca at 1300–2400 m.

Miconia danielii is here assigned to section *Cremanium* (D. Don) Naudin based on its obovoid anthers that are 4-celled and 4-pored. It is defined by a consistent combination of vegetative and floral features. It has an indument of bran-like and ± flattened dendritic hairs on upper internodes, petioles, abaxial foliar veins, and inflorescence branches; 5-nerved, elliptic-ovate leaf blades with an acuminate to caudate-acuminate apex and conspicuously serrulate margins; white anther thecae that are 4-celled and 4-pored; an anther connective that is prolonged dorso-basally into a caudiform appendage and prolonged ventrally at the base of each anther sac into a deflexed lobule; a peltate stigma; and a vaguely granulate seed coat.

Among species of *Miconia* sect. *Cremanium* (D. Don) Naudin, *M. danielii* resembles *M. coriacea* (Swartz) DC. and *M. cremadena* Gleason in various details. The former differs from *M. danielii* in being dioecious and in having a deciduous-furfuraceous or matted furfuraceous indument, 2-celled and 2-pored anthers, a distally fistulose style and capitate stigma with a crateriform apex, and a smooth seed coat. *Miconia cremadena* differs most notably from *M. danielii* in its elliptic-oblong leaves with inconspicuously crenulate to subentire margins, and a glandular puberulence on the filaments and basally prolonged anther connective.

Etymology. This species is named for my colleague Thomas F. Daniel (b. 1954), co-collector of the type, student of Neotropical Acanthaceae, and field companion on several expeditions to Central America.

Paratypes. COSTA RICA. **Cartago:** 8 km N of Trinidad on S-facing slopes of Volcan Turrialba, *Almeda et al. 2883* (CAS); Cantón de Paraiso, P. N. Tapantí, Valle de Reventazón, Río Grande de Orosí, sector la Represa, *Mora 527* (CAS, CR, INB, MO); 1–2 km N of El Empalme, along trail N of old Pan-American Highway, *Utley & Utley 2466* (CAS, CR). **Heredia:** headwaters of Río Santo Domingo, ca. 3 km NE of San Rafael de Varablanca, N slope of Volcán Barva, *Grayum 7231* (CAS, CR, MO). **San José:** Las Nubes, *Standley 38473* (US); near Finca La Cima, above Los Lotes, N of El Copey, *Standley 42685* (US).

Miconia dissita Almeda, sp. nov. TYPE: Panama. Bocas del Toro: Edwin Fabrega Dam & Reserve in Fortuna, along Continental Divide trail bordering Chiriquí, 08°45′04″N, 82°15′04″W, 1200–1300 m, 16 Jan. 1989 (fl), *F. Almeda, G. de Nevers & G. McPherson 6246* (holotype, CAS; isotypes, MO, PMA). Figure 3.

Section *Cremanium.* Frutex vel arbuscula 1.3–5 m; ramuli obtuse quadrangulati sicut inflorescentia hypanthiaque pilis asperis et pilis stellatis induti. Lamina 5.1–18 × 2.4–9.8 cm elliptica vel elliptico-ovata 3- ad 5-nervata vel 3- ad 5-plinervata, supra et subtus glabra. Panicula 4–14 cm multiflora, flores 5-meri, calycis tubus 0.2–0.25 mm altus, lobis interioribus 0.5 × 1 mm, dentibus exterioribus acutis 0.25 mm lobos interiores aequantibus vel paulo brevioribus; stamina isomorphica glabra, antherarum thecae 1.2 mm oblongae 2-porosae, poro ventraliter inclinato; connectivum nec prolongatum nec appendiculatum; ovarium 3-loculare et ½ inferum apice glabro.

Shrub or small tree 1.3–5 m tall with somewhat swollen uppermost cauline nodes, the rounded-quadrate uppermost cauline internodes, inflorescence branches, and hypanthia moderately covered with scurfy asperous-headed and/or stellulate hairs. Leaves of a pair subequal to somewhat unequal in size; petioles 0.7–8 cm long, the blades 5.1–18 × 2.4–9.8 cm, 3- to 5-nerved or if 3- to 5-plinerved then the innermost pair of primary veins diverging from the midvein 0.5–1.1 cm above the blade base, the blades elliptic to elliptic-ovate, the apex acuminate, the base acute to obtuse or rounded, the margin entire, glabrous on both surfaces. Inflorescence a multiflowered panicle 4–14 cm long with lateral branches diverging from the central axis at essentially right angles; flowers 5-merous, subsessile or on pedicels to 0.5 mm long; the bracteoles 0.2 × 0.1 mm, triangular, inconspicuous and early-deciduous. Calyx tube 0.2–0.25 mm long, the calyx lobes 0.5 × 1 mm, rounded-triangular, the exterior calyx teeth 0.25 mm long, triangular, ± equaling the calyx lobes but barely or not protruding beyond the calyx lobes; petals 1–1.5 × 1 mm, white, glabrous abaxially but often warty-papillate adaxially when dry, oblong-obovate to obovate; anthers 1.2 mm long, isomorphic, white, oblong, 4-celled with 2 ventrally inclined pores; connective thickened and ± elevated dorso-basally but neither prolonged nor appendaged; style 4–6 mm long, glabrous; stigma capitate; ovary 3-locular, ½ inferior, the apex

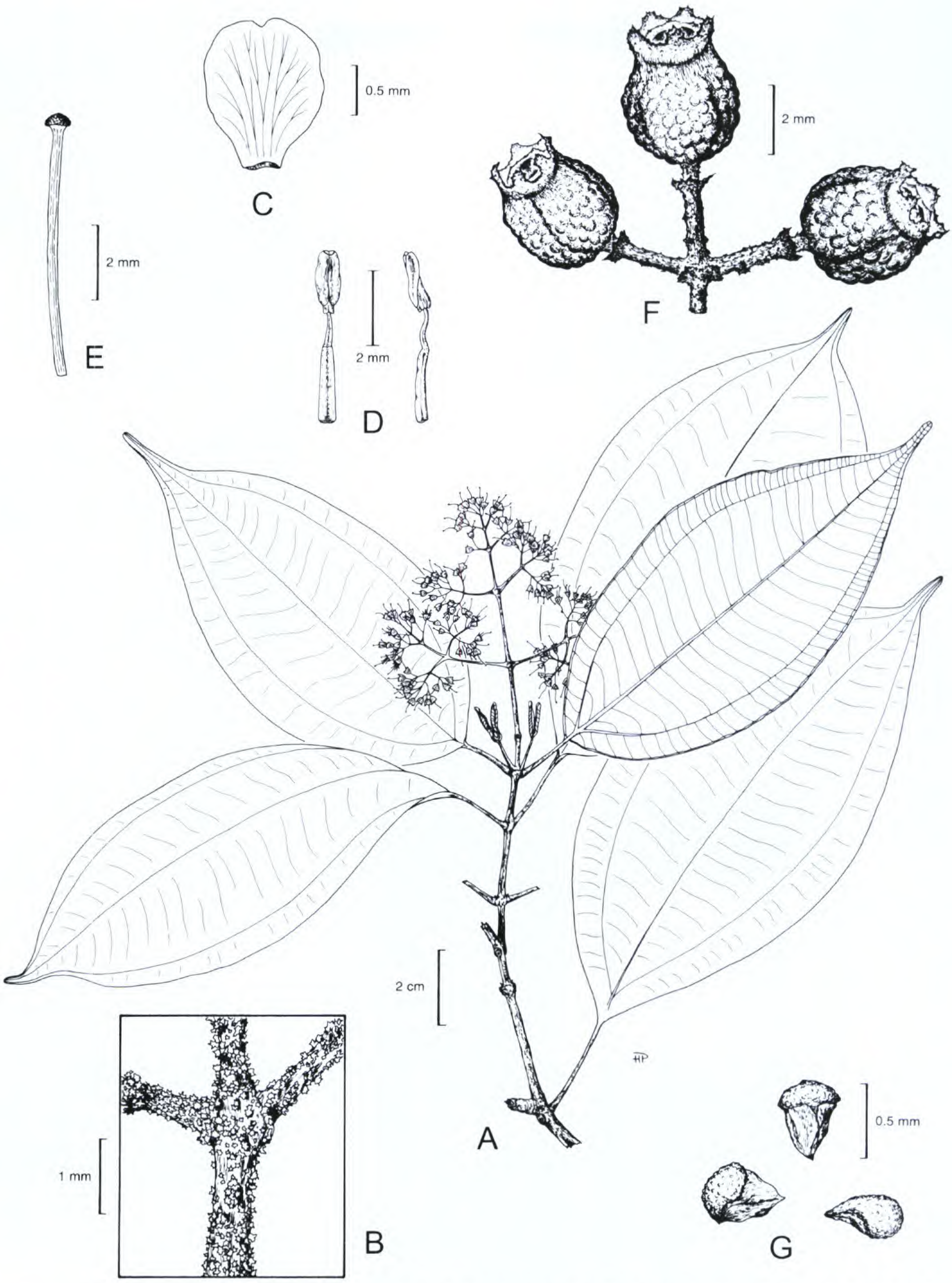


Figure 3. *Miconia dissita* Almeda. —A. Habit. —B. Enlargement of cauline indument. —C. Petal (adaxial surface). —D. Stamens, ventral view (left) and profile view (right). —E. Style and stigma. —F. Fruits. —G. Seeds. (A, B from *McPherson 12013*; C–E from *Almeda et al. 6226*; F from *Antonio 4057*; G from *Croat 66632*.)

glabrous. Berry 3.5–4 × 3.5–4 mm when dry, blue-green to blue-white at maturity; seeds 0.5 mm long, ± ovoid, the testa muricate.

Phenology. Flowering specimens have been collected from January through March; fruiting material has been collected from January through April, June, July, and September.

Distribution. Locally common to uncommon in cloud forest understory from Costa Rica's Cordillera Central (P. N. Braulio Carrillo) and Cordillera de Talamanca (vicinity of Cerro Duán) disjunctly west to Panama from the Edwin Fabrega Dam area in Fortuna to Cerro Colorado at 800–1500 m.

Miconia dissita is here placed in section *Cremanium* because of its 4-celled anthers with two apical pores. Its anther theceae are more elongate and less obovoid than many members of section *Cremanium*, but its affinities are clearly with members of this section. I initially identified many specimens of *M. dissita* as *M. tonduzii* Cogniaux var. *latifolia* Cogniaux (here reduced to the synonymy of *M. tonduzii* var. *tonduzii*) because of its comparatively wide leaf blades, 4-celled anthers, and capitate stigma. Closer inspection in the field and herbarium revealed a number of characters that cannot be accommodated in the range of variability here attributed to *M. tonduzii*. *Miconia dissita* can be recognized by its somewhat swollen distal nodes and lateral inflorescence branches that diverge from the main axis at angles of 90° or more. It also has a distinctive indument on upper internodes, inflorescence branches, and hypanthia that consists of scurfy asperous-headed and/or stellulate hairs and anther thecae that are widest at the middle with no evidence of a septum protruding beyond the apex of the anther thecae. The leaf blades of *M. dissita* are consistently entire, the adaxial petal surfaces frequently appear warty-papillate (in part) upon drying, and the seed coat is muriculate.

Among species of section *Cremanium*, *Miconia dissita* appears to be most closely related to *M. tonduzii* var. *tonduzii*. In the latter, the distal nodes are not noticeably swollen, the lateral inflorescence branches diverge from the central axis at angles of about 45°, the indument is amorphous-furfuraceous puberulent or lacking, and the anther thecae are widest distally with an evident septum slightly protruding beyond the perimeter of the anther pore. Other differences that set *M. tonduzii* var. *tonduzii* apart from *M. dissita* are the remotely and obscurely denticulate to subentire leaf margins, completely smooth petal surfaces, and the obscurely granulate seed coat.

Etymology. The specific epithet is derived from the Latin word, *dissitus*, meaning lying apart, remote, or well-spaced, in reference to the spacing of lateral divergent branches on the inflorescence.

Paratypes. COSTA RICA. **San José:** Bajo Hondura, Parque Nacional Braulio Carrillo, *Davidse et al. 23199* (CAS, CR, MO). **Cartago:** ca. 2 km E of Cachí along road paralleling Río Naranjo toward Cerro Duán, *Utley 5887* (CAS, DUKE). PANAMA. **Bocas del Toro:** along road betw. Fortuna Dam & Chiriquí Grande along gravel road which departs main hwy. near Continental Divide (4.5 mi. N of bridge over Fortuna lake), *Croat 66632* (CAS, MO); forest near headwaters of Río Culebra ca. 5 km ENE of Cerro Pate Macho, *Hammel 6116* (CAS, MO, PMA); vic. of Cerro Colorado mine above San Felix, along trails N of road along Continental Divide, *McPherson 12013* (CAS, MO). **Chiriquí:** Edwin Fabrega Dam & Reserve in Fortuna along trail to Río Hornito above Los Planes, *Almeda et al. 6318* (CAS, MO, PMA); along road betw. Gualaca & Fortuna Dam site at 10.1 mi. NW of Los Planes de Hornito, *Antonio 4057* (CAS, MO, PMA); Fortuna Dam area along Quebrada Bonito to E of road, *Churchill et al. 4766* (CAS, MO).

Miconia lundellii (Wurdack) Almeda, comb. nov. Basionym: *Clidemia lundellii* Wurdack, Wrightia 5: 227. 1976. TYPE: Guatemala. Baja Verapaz: Union Barrios, W of km 159, 13 Aug. 1975, *C. L. Lundell & E. Contreras 19626* (holotype, US; isotypes, F, LL).

Section *Octomeris*. Shrub 1–2 m tall, the rounded-quadrate upper internodes, petioles, inflorescence axes, pedicels, hypanthia and calyx teeth densely covered with rusty-brown straight and/or curly tangled hairs 1–4 mm long underlain with a very sparse scattering of minute glands, the petiolar hairs often inconspicuously bifid apically. Leaves of a pair ± equal to somewhat unequal in size; petiole 1–4 cm long, blade 6–11.3 × 2.9–5.8 cm, elliptic-ovate, 5- to 7-plinerved with the innermost pair of primary veins diverging from the midvein 0.5–1.5 cm above the blade base, apex short-acuminate, base rounded to obtuse, the margin entire to obscurely crenulate, copiously ciliate, the adaxial surface moderately covered with somewhat spreading smooth hairs 1–2 mm long, the abaxial surface (including primary and higher order veins and actual surface) moderately covered with spreading rusty-brown smooth hairs ca. 1 mm long and sparsely underlain with ± sessile glands. Inflorescence a terminal paniculiform dichasium 2.5–5 cm long; flowers 5-merous on pedicels 2–5 mm long; the bracts and bracteoles 2–9 × 0.75–2 mm, narrowly oblong, tardily deciduous, ciliate, sparingly setose to glabrous on both surfaces. Hypanthium with an indument like the cauline internodes, but the hairs prevailingly straight and not curly; calyx

lobes 0.75 × 1 mm, broadly triangular, commonly concealed by the linear-oblong exterior teeth that are 1.5–2 mm long; petals 5–6 × 3–3.5 mm, glabrous, oblong-obovate; filaments 4–5 mm long, anthers 2.7–3.5 mm long, yellow, the apical pore ventrally inclined; connective thickened dorso-basally and prolonged below the thecae ca. 0.25 mm, otherwise exappendiculate; ovary 5-locular, ⅔-inferior, apex elevated into a depressed ± crateriform dome that probably flattens out on maturing fruits. Mature berries and seeds are unknown.

Phenology. This species is known from only the type and one other collection; the August collection is in flower, the February collection is in young fruit.

Distribution. Apparently endemic to Guatemala (Baja Verapaz), where it occurs in montane evergreen forests. No elevational data are given on known collections, but judging from the collection localities this species appears to occur at elevations of about 2000–2100 m.

The elongate anthers and regularly lobed calyx of *Miconia lundellii* dictates placement in section *Octomeris* Triana. Wurdack describes the inflorescence of this species as seemingly terminal. Examination of the two known collections verifies his observation. There is no indication on either specimen that lateral shoots eventually overtop the inflorescence so that it becomes pseudolateral like a typical member of the genus *Clidemia*. In view of the apical dominance exhibited by the inflorescence of this species, I see no justification for maintaining it in *Clidemia* and here transfer it to *Miconia*. Fruiting material of this rare species is needed before its intrageneric affinities can be assessed with confidence. *Miconia lundellii* is readily recognized by its 5-merous flowers, 5-locular ovary, copious rusty brown indument of straight and/or curly tangled hairs, petiolar hairs that are often inconspicuously bifid apically, linear-oblong exterior calyx teeth that conceal the broadly triangular calyx lobes, and the unappendaged anther connectives.

Additional specimen examined. GUATEMALA. **Baja Verapaz:** Union Barrios on Salamá/Coban road, W, 3 km, on top of hill, *Lundell & Contreras 18958* (CAS, LL).

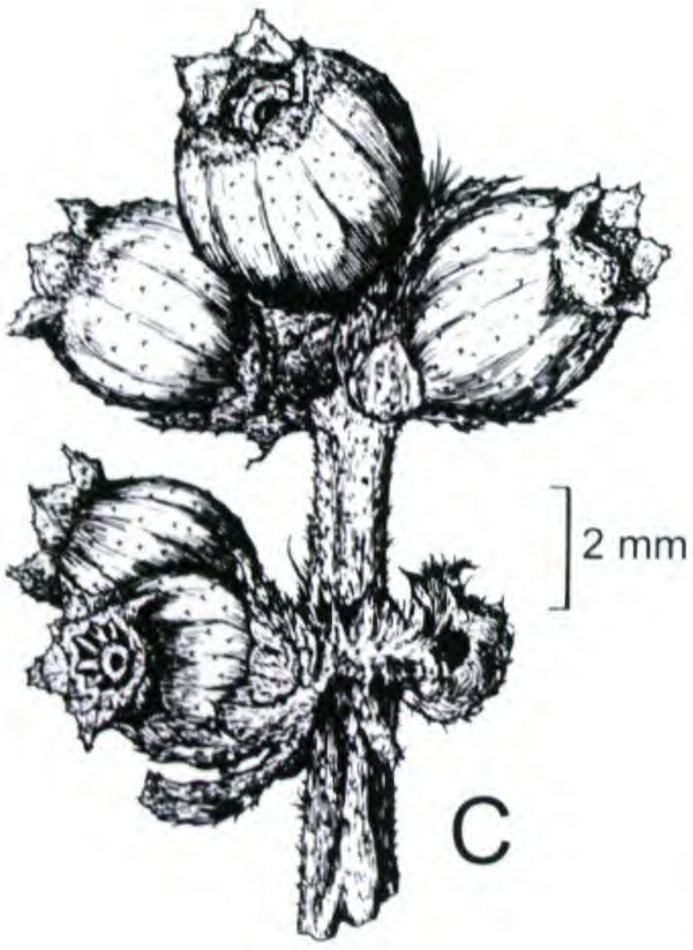
Miconia sparrei Wurdack, Phytologia 35: 245. 1977. TYPE: Ecuador. Morona-Santiago: Misión Salesiana, Gualaquiza, 700–800 m, 3 Oct. 1967, *B. Sparre 19290* (holotype, S; isotype, US). Figure 4.

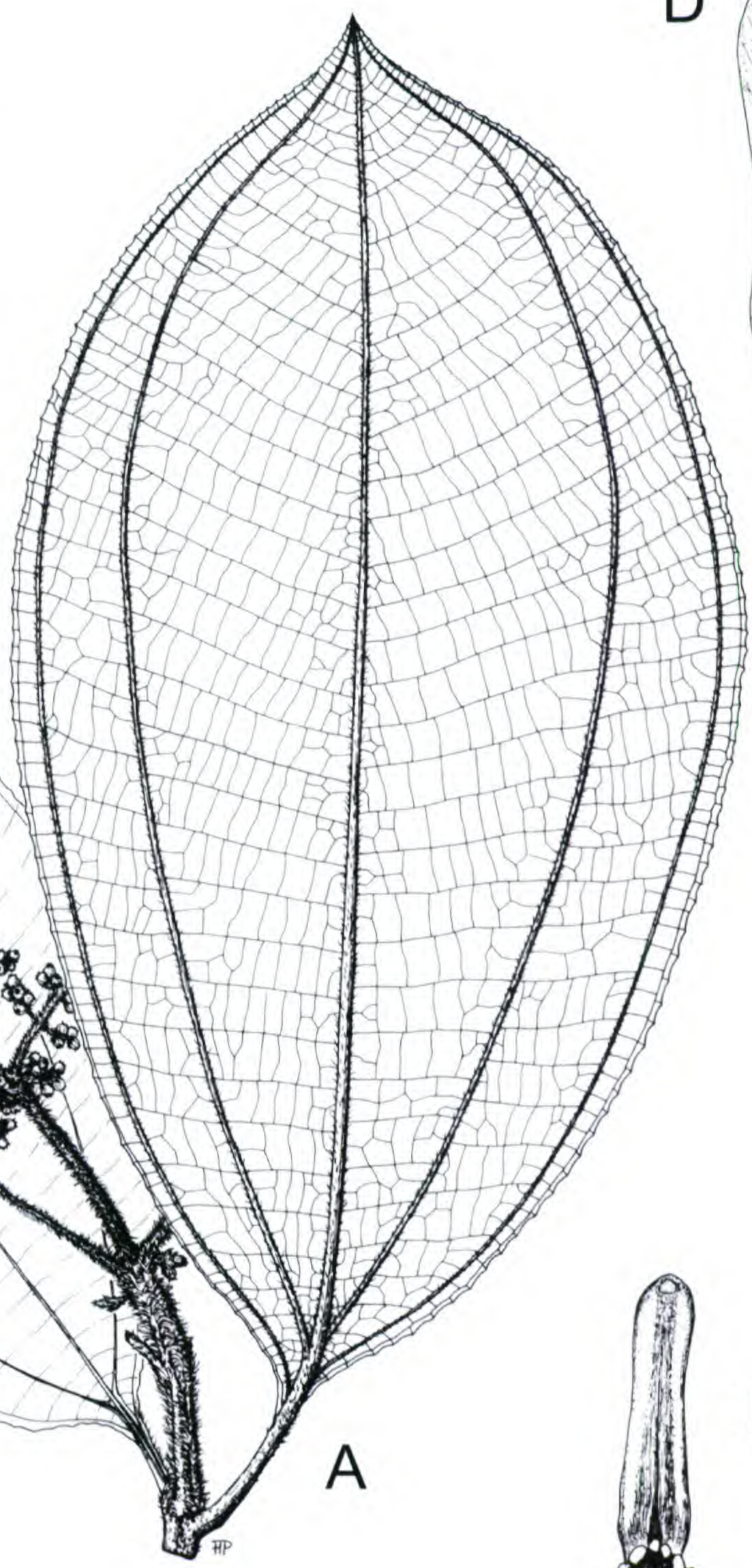
Section *Tamonea*. Shrub or small tree 4–8 m tall, the rounded-quadrate uppermost cauline internodes (densely), petioles (moderately), and inflorescence branches (densely) setose with spreading ± flattened barbellate trichomes 2–9 mm long. Leaves of a pair somewhat unequal in size; petioles 3–5.5 cm long; the blades oblong-elliptic to elliptic-obovate, 30–55.5 × 13–28 cm, 5-plinerved (often with an additional inframarginal pair of veins extending half to ⅔ up the length of the blade), the innermost pair of primary veins diverging 1.5–3.3 cm above the blade base, the apex short-acuminate, the base obtuse, the margin denticulate, the abaxial blade surface essentially glabrous, the adaxial surface sparsely to moderately covered with spreading roughened or barbellate hairs on the primary and secondary veins but glabrous on the venules and actual surface. Inflorescence a multiflowered panicle 15–30 cm long with 5-merous sessile flowers borne in glomerules at the ends of the branchlets; the persistent narrowly triangular bracteoles 2–5 × 0.75–2 mm with stramineous crisped hairs at or near the base. Hypanthium sparsely stellulate-puberulent; calyx tube 0.5 mm long, the calyx lobes 0.25 × 1 mm, deltoid; the exterior calyx teeth small thickened callosities ca. 0.5 mm long that essentially obscure the calyx lobes; petals 2.5–4 × 1–1.8 mm, white, distinctly but minutely papillose abaxially and along the distal half adaxially; anthers somewhat dimorphic, linear-oblong; the thecae alternately 2 and 2.3–2.4 mm long with a ventrally inclined apical pore; the connective not prolonged abaxially but enlarged at the base of each anther sac and fringed with conspicuous glands; style 6 mm long, glabrous; stigma ± truncate to barely expanded; ovary 3-locular, ⅓ inferior, apex elevated into a low stellate-puberulent collar. Berry 4 × 5 mm when dry, reportedly yellow turning black at maturity; seeds 1.5 mm long, ± triangular with an angulate convex face, the testa smooth and glossy.

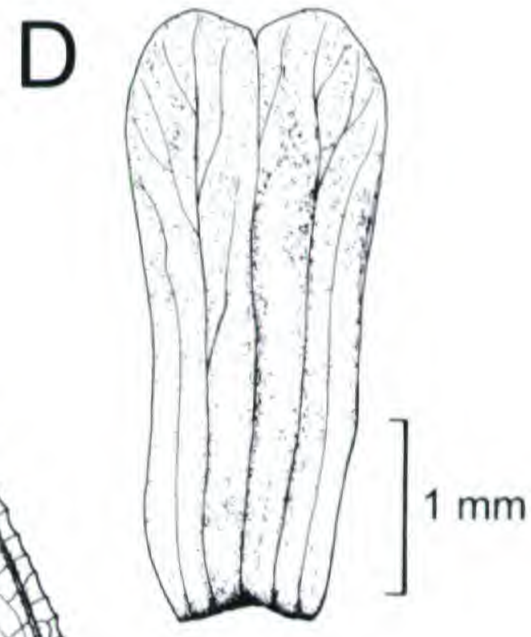
Phenology. Flowering collections have been made in June and September; fruiting collections in February through June and in September.

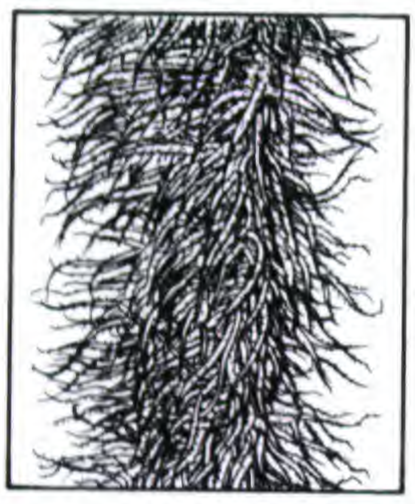
Distribution. Rare and uncommon in primary rainforest at 30–800 m. It is presently known in a region extending from La Virgen to the OTS La Selva Biological Station in the Caribbean lowlands of Costa Rica, in Amazonian Ecuador, where it is known only from the type locality, and from Peru.

Based on its elongate subulate anthers and apically retuse petals, *Miconia sparrei* is assigned to section *Tamonea* Cogn. I here provide an expanded description and illustration (Fig. 4) for this species, which has heretofore been known only from lowland Amazonian Ecuador. Its discovery in the Caribbean lowlands of Costa Rica may seem surprising but it









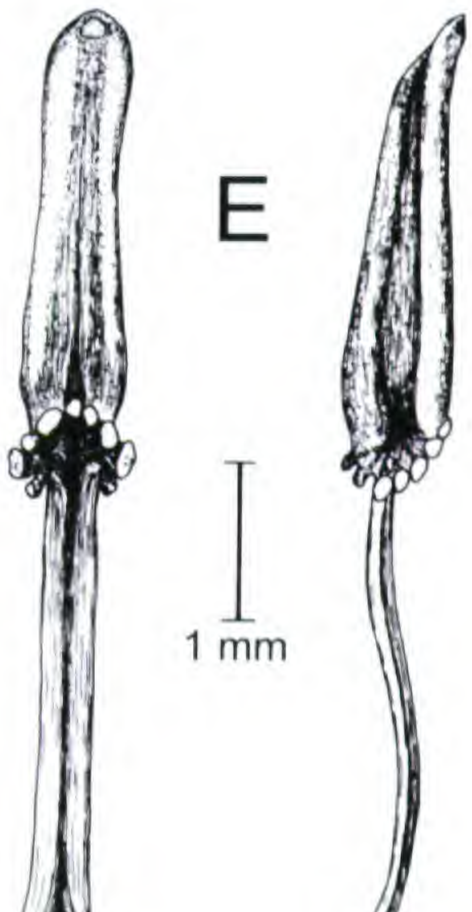


Figure 4. *Miconia sparrei* Wurdack. —A. Habit. —B. Enlargement of cauline indument. —C. Mature berries. —D. Petal (adaxial surface). —E. Stamens, ventral view (left) and profile view (right). —F. Seeds. (A–F from *Zamora et al. 2451*.)

is not unusual in view of distribution patterns seen elsewhere in the family. Wurdack (1980: 4) notes a recurrent distributional pattern among Ecuadorian Melastomataceae that includes Costa Rica–Panama, western Colombia, and the lower eastern slopes of the Andes.

Miconia sparrei is distinguished by its large leaf blades, upper cauline internodes that are densely covered with spreading, roughened or barbed ± flattened trichomes, sessile flowers, anther connectives that are enlarged at the base and edged with several large glands, and ± triangular seeds with a smooth glossy testa and an angulate convex face.

Representative specimens examined. COSTA RICA. **Heredia:** Finca La Selva, the OTS Field Station, Río Puerto Viejo at Pasos Perdides entre los postes 3000 a 3200, *Chacón 618* (DUKE), in forest along S edge of Vargas property, *Hammel 11224* (CAS, DUKE), primary forest, SE section of new property, *Hammel 11659* (CAS, DUKE); Est. Biol. La Selva, Sendero Ribereño a Río Peje, *Hammel 17439* (CAS, DUKE); Cantón de Sarapiquí, Llanura de San Carlos, La Virgen, Finca La Tirimbina, *Zamora et al. 2451* (CAS, CR, F, INB, MO). PERU. **Huánuco:** *Morawetz & Wallnöfer 18–22888* (US). **San Martín:** *Schunke-Vigo 6949* (US).

Miconia tonduzii Cogniaux var. **tonduzii** Cogniaux, in A. DC. & C. DC., Monogr. Phan. 7: 1191. 1891. *Miconia tonduzii* var. *furfuracea* Cogniaux, in A. DC. & C. DC., Monogr. Phan. 7: 1191. 1891. Syn. nov. TYPE: Costa Rica. In sylvis ad Rancho Flores, alt. 2043 m, *A. Tonduz 2115* (neotype, here designated, BR; isotype, US).

Miconia tonduzii var. *cuneata* Cogniaux, in A. DC. & C. DC., Monogr. Phan. 7: 1191. 1891. Syn. nov. TYPE: Costa Rica. In sylvis ad Rancho Flores, alt. 2500–2700 m, *H. F. Pittier 1948* (holotype, BR; isotype, US).

Miconia. tonduzii var. *latifolia* Cogniaux, in A. DC. & C. DC., Monogr. Phan. 7: 1191. 1891. Syn. nov. TYPE: Costa Rica. Ad Rancho Flores, mont. Barba, *A. Tonduz 2112* (holotype, BR; isotype, US).

Section *Cremanium*. Shrubs or small trees 2–6 m tall, the young branchlets, elevated primary leaf veins beneath, and inflorescences sparsely furfuraceous-puberulent to glabrate. Leaves of a pair equal to somewhat unequal in size; petioles 1–4.5 cm long. Leaf blades 7.5–16 × 3–5 cm, 3- to 5-nerved, elliptic to elliptic-lanceolate, adaxially glabrous, abaxially sparingly furfuraceous-puberulent to glabrate, apex gradually acuminate, base acute to rounded, the margin remotely and obscurely denticulate to subentire. Panicle 5–8 cm long; flowers 5-merous on pedicels 1–2 mm long, the bracteoles 0.5–1.5 mm long, subulate and early-deciduous. Hypanthia obscurely and deciduously puncticulate-lepidote, but often appearing glabrous; calyx tube 0.5 mm long, the oblong apically rounded lobes 0.5–0.7 mm long, the bluntly tuberculate teeth 0.5 mm long, appressed to but not exceeding the lobes; petals 2–2.5 × 2–2.5 mm, obovate, glabrous; stamens isomorphic; anthers 1.5 mm long, cuneate, 4-celled, white or white flushed with pink, the pore widest distally, somewhat retuse and ventrally inclined with the septum slightly protruding beyond the perimeter of the anther; connective thickened dorso-basally into a bluntly lobulate spur and prolonged ventro-basally into a bilobulate appendage; style 4–5 mm long, glabrous; stigma capitate; ovary 3-locular, ⅔ inferior, apex elevated into a lobulate glabrous collar. Berry 4–5 × 4–5 mm, blue-green then turning purple at maturity; seeds 0.5 mm long, ovoid, obscurely granulate.

Phenology. Flowering specimens have been collected from January through May; fruiting collections have been made in January and from March through October.

Distribution. Locally common in cloud forests and elfin forests from Nicaragua (Cerro Pataste, east to the Cordillera Dariense and north to the Cordillera Isabella and Cerro Saslaya), south to Costa Rica, where it occurs from the Cordillera Central south to the Cordillera de Talamanca at 1300–3000 m.

Miconia tonduzii was assigned to section *Cremanium* by Cogniaux (1891) based on its cuneiform, 4-celled anthers. When he described *Miconia tonduzii* he neglected to cite any specimens under the nominate variety. Following the description of the species he provided diagnoses for six varieties and also listed a type specimen for each. I here recognize only two of the six varieties circumscribed by Cogniaux and describe a third one as new. Because Cogniaux did not specifically name a *M. tonduzii* var. *tonduzii*, I here neotypify the nominate variety. In doing so, I have selected the type of *M. tonduzii* var. *furfuracea* to become the type of the species. What has passed as *M. tonduzii* var. *furfuracea* is the most commonly encountered variety in this species complex. The nominate variety is characterized by its furfuraceous puberulence on upper cauline internodes, inflorescence branchlets, and primary veins on abaxial leaf surfaces.

Miconia tonduzii Cogniaux, a variable and puzzling species complex of southern Central America, is recognized by its 4-celled cuneate, broad-pored anthers with filaments that conspicuously exceed the petals in length and capitate stigmas. Cogniaux's six varieties were based largely on minor differences in the size and dentition of leaf blades

and details of the indument. All of his varieties, except *M. tonduzii* var. *oblongifolia* Cogniaux, which I am relegating to the synonymy of *Miconia carnea* Cogniaux, are readily accommodated in what I consider to be two infraspecific taxa worthy of recognition.

In addition to the three varieties treated here, another seemingly distinct population of *Miconia tonduzii* is known from Volcan Mombacho, Nicaragua (*Neill 1396*, CAS), and other mountaintops in Costa Rica and Panama. Plants from these populations are glabrous and the obscurely serrulate subentire leaf blades are somewhat shorter (4.5–8.3 cm) than typical for the species. Additional study is needed to properly evaluate the taxonomic status of these and other related populations and to determine whether *M. tonduzii* s.l. should be merged with the closely related *M. carnea*.

All populations of *M. tonduzii* s.l. that I have examined have hermaphroditic flowers, but one specimen (*Almeda & Nakai 3829*, CAS) has some stamens on some flowers that appear to be abortive and non-polleniferous.

Representative specimens examined. NICARAGUA. **Atlántico Norte:** near summit of Cerro Saslaya, *Neill 3849* (CAS, MO). **Jinotega:** km 155 de la carr. entre Matagalpa y Jinotega, en las Pilas, *Moreno 510* (CAS). **Madriz:** Cerro Pataste, ca 20 km SO de Ciudad Somoto, *Grijalva 912* (CAS, MO). **Matagalpa:** Cerro El Picacho above Hotel Santa Maria de Ostuma, *Nee 27634* (CAS, MO). COSTA RICA. **Alajuela:** ca. 15–20 km N of Sarchí on road to Bajos del Toro Amarillo, *Almeda et al. 7366* (CAS, CR). Cartago: ca 14 km SE of El Empalme, Cordillera de Talamanca, *Almeda et al. 3110* (CAS). **Heredia:** SW flanks of Volcán Barva above Sacramento, vic. of Laguna Barva, *Almeda et al.* 3275 (CAS, CR); road betw. San Rafael & Río Las Vueltas, N of Cerro Chompipe, *Stevens 14037* (CAS, MO). **San José:** Cantón de Perez Zeledon, Cordillera de Talamanca, Camino a la Auxiliadora, 4 km E de Villa Mills, *Gamboa & Picado 398* (CAS, INB).

Miconia tonduzii Cogniaux var. **hirtella** Almeda, var. nov. TYPE: Costa Rica. Cordillera de Talamanca, on right-hand turn onto a gravel road off the Interamerican Hwy. ca. 1 km beyond La Georgina en route to San Isidro de El General, 9700 ft. [2939 m], 9 Mar. 1981 (fl), *F. Almeda & K. Nakai 4809* (holotype, CAS). Figure 5.

Section *Cremanium*. Frutex vel arbuscula 1–5 m; ramuli sulcato-quadrangulati sicut petioli foliorum subtus venae primariae et secundariae sparsiuscule setosis pilis plerumque 0.5–3 mm longis laevibus et lepidotis induti. Lamina 4.3–13 × 1.6–8 cm elliptica vel elliptico-ovata 5-plinervata, supra glabra vel sparse setulosa pilis laevibus ca. 0.5–1 mm longis. Panicula 8–15 cm multiflora, flores 5-meri; calycis tubus 0.25 mm altus, lobis interioribus 0.5 × 1 mm, dentibus exterioribus acutis 0.3 mm lobos interiores brevioribus; stamina isomorphica glabra, antherarum thecae 1.5 mm oblongo-cuneatae 2-porosae, poro ventraliter inclinato; connectivum ad basim ventraliter paulo bilobulato-prolongatum; ovarium 3-loculare et ½ inferum apice glabro.

Shrub or small tree 1–5 m tall, the rounded-quadrate to quadrisulcate uppermost cauline internodes and petioles sparsely covered with smooth spreading hairs 0.5–3 mm long underlain with a sparse brown-lepidote indument. Leaves of a pair equal to subequal in size; petioles 1–3 cm long; blades 4.3–13 × 1.6–5(–8) cm, 5-plinerved, the innermost pair of primary veins diverging from the midvein 1.5–3(–9) mm above the blade base, the blade elliptic to elliptic-ovate rarely varying to almost obovate, the apex acuminate, the base obtuse to almost rounded, the margin ciliate-serrulate, the adaxial surface essentially glabrous or sometimes with a few scattered smooth spreading hairs 0.5–1 mm long, the abaxial surface sparsely covered with spreading smooth hairs 0.5–2 mm long on primary and higher order veins and sparsely brown lepidote on the actual surface. Inflorescence a multiflowered panicle 8–15 cm long, the main branches and pedicels sparsely brown-lepidote; flower 5-merous on pedicels 1–2.5 mm long, the early deciduous bracteoles 0.5–0.75 mm long, linear-subulate and filiform. Calyx tube 0.25 mm long, the calyx lobes 0.5 × 1 mm, rounded-triangular, calyx teeth 0.3 mm long, bluntly triangular, appressed to and shorter than the calyx lobes; petals 1.5–2.5 × 1.5–2 mm, white, glabrous, obovate; anthers 1.5 mm long, isomorphic, white, cuneate and widest apically, 4-celled with two ventrally inclined pores and a septum protruding somewhat beyond the perimeter of the pores; connective thickened and somewhat dilated dorso-basally and prolonged ventro-basally into a bilobulate appendage; style 4–5 mm long, glabrous; stigma capitate; ovary 3-locular, ½-inferior, the apex glabrous and ± rounded on mature fruits. Berry 3.5–4 × 3.5–4 mm when dry, pale blue-green at maturity; seeds 0.5 mm long, ovoid, the testa granulate.

Phenology. Flowering from January through May; fruiting from March through June.

Distribution. Endemic to Costa Rica where it is locally common in cloud forests and montane pastures on the Cordillera Central (Vol. Barva, Vol. Irazú, and Vol. Turrialba), Cerros de Escazú, and the Cordillera de Talamanca at 2300–3000 m.

This variety is readily distinguished from the other infraspecific taxa of *Miconia tonduzii* by the ciliate-serrulate leaf margins and the spreading blackish indument of smooth trichomes on upper

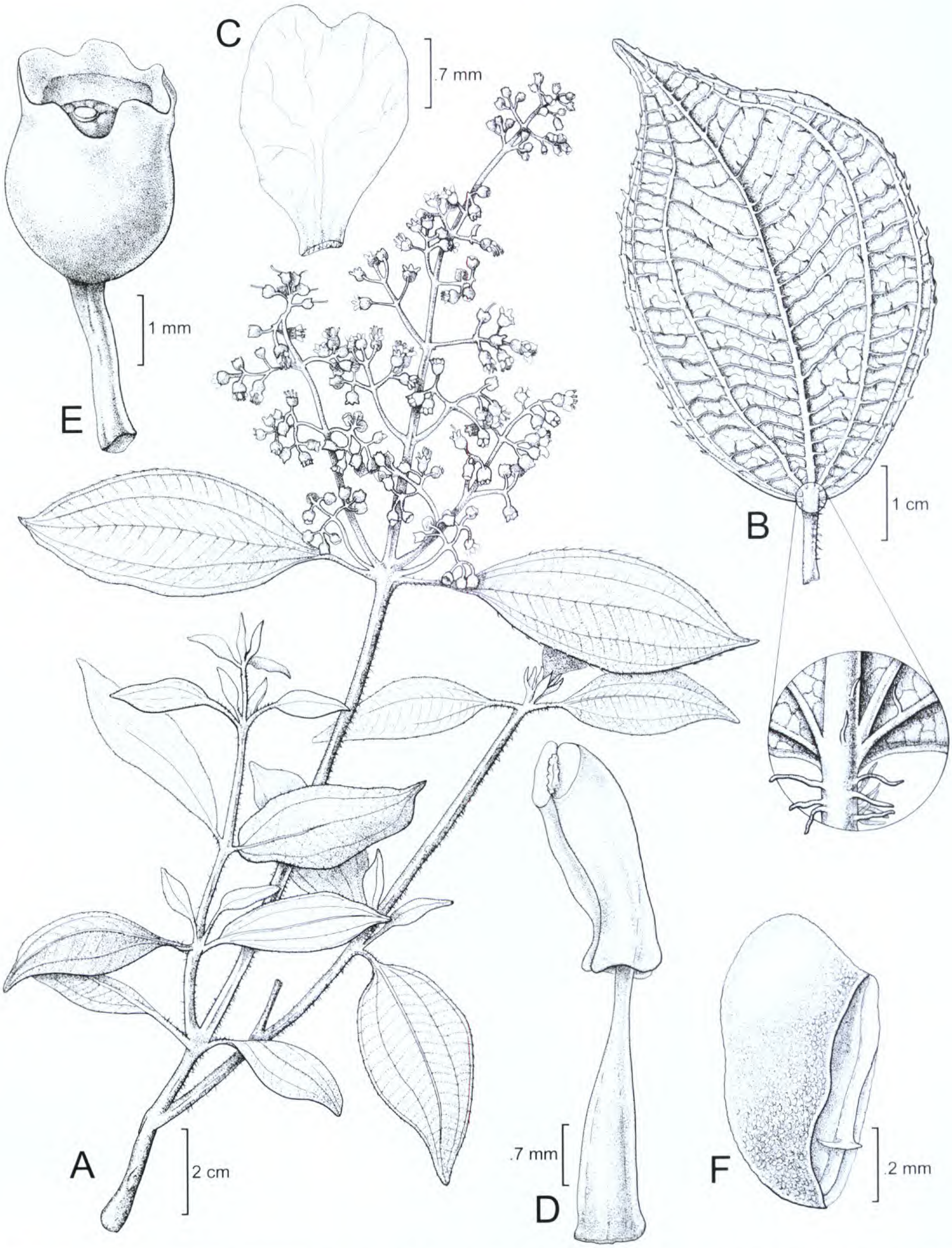


Figure 5. *Miconia tonduzii* Cogniaux var. *hirtella* Almeda. —A. Habit. —B. Representative leaf (abaxial surface). —C. Petal (adaxial surface). —D. Stamen (¾ profile view). —E. Berry. —F. Seed. (A–E from the holotype *Almeda & Nakai 4809*; F from *Almeda & Nakai 4799*.)

cauline internodes and petioles. These spreading trichomes are also found on inflorescence branches of some specimens and the abaxial surfaces of some leaves. This is the only variety of *M. tonduzii* that is restricted to Costa Rica. Populations from Cerro Daser differ in having modally larger leaf blades (up to 13 cm long and 8 cm wide) that are ± obovate. In all other features this foliar variant is identical to typical populations of this variety.

Etymology. The varietal epithet is derived from the Latin word *hirtus*, hairy or rough, in reference to the spreading hairs on distal internodes and petioles.

Paratypes. COSTA RICA. **Cartago:** Volcán Irazú in pasture along CR rte. #40 from Cartago to the crater, *Barringer et al. 3239* (CAS, F); Villa Mills area near Cerro de la Muerte, *Hufi et al. 2155* (CAS, MO); vic. La Picada & Finca Retiro on E slope of Volcán Turrialba, *Wilbur 24676* (CAS, DUKE). **Cartago/San José border:** 15 km SSE of El Empalme intersection on the Cordillera de Talamanca, *Almeda et al. 3375* (CAS); Cordillera de Talamanca, vic. of Ojo de Agua, *Almeda & Nakai 4799* (CAS). **Heredia:** Cantón de Barva, Parque Nac. Braulio Carrillo, Estación Barva, *Fernández 1466* (CAS, INB, MO); Volcán Barva approaching La Laguna on Pacific side, *Lumer 1177* (CAS, CR, NY). **San José:** Cerros de Escazú, Cerro Daser from ca. 200 m below the crest to the top, *Utley & Utley 2285* (CAS, CR); ca. 5 km W-SW of Aserrí along upper slopes & summit of Cerro Daser, *Almeda & Nakai 3663* (CAS).

M. tonduzii Cogniaux var. **serrulata** Cogniaux, in A. DC. & C. DC., Monogr. Phan. 7: 1191. 1891. TYPE: Costa Rica, secus Río Poás ad mont. Iscazu, alt. 2100 m, *H. F. Pittier 2393* (holotype, BR; isotype, US).

Miconia tonduzii var. *parvifolia* Cogniaux, in A. DC. & C. DC., Monogr. Phan. 7: 1191. 1891. Syn. nov. TYPE: Costa Rica, in sylvis ad Rancho Flores, alt. 2043 m, *A. Tonduz 2116* (holotype, BR).

Section *Cremanium*. Shrubs or small trees 2–5 (–9) m tall, juvenile leaves and vegetative buds sparsely and deciduously furfuraceous-puberulent to glabrate. Leaves of a pair equal to somewhat unequal in size; petioles 1–3 cm long; blades 6–12 × 2–4 cm, 3-nerved or 3-plinerved, often with a depressed pair of intramarginal veins, elliptic, adaxially glabrous, abaxially sparsely and inconspicuously lepidote, apex gradually acuminate to caudate-acuminate, base acute, the margin conspicuously serrulate. Panicle 4–10 cm long; flowers 5(to 6)-merous on pedicels 0.25–0.5 mm long, the deciduous elliptic bracteoles 2–3.5 mm long. Hypanthia obscurely and deciduously puncticulate-lepidote, but appearing glabrous; calyx tube 0.25 mm long, the oblong apically rounded lobes 0.5–0.7(–1) mm long, the tuberculate teeth 0.5–0.7 mm long, appressed to and not exceeding the lobes; petals 1.5–2.5 × 1.5–2 mm, obovate, glabrous; stamens isomorphic; anthers 1–1.5 mm long, 4-celled, cuneate, white, the broad pore ventrally inclined; connective thickened dorso-basally into a blunt lobe or spur, but ventro-basally adnate to the thecae to form a bilobulate appendage; style 5 mm long, glabrous; stigma capitate; ovary 3-locular, ½ inferior, apex shallowly fluted and sparingly glandular-puberulent to glabrate. Berry 5–6 × 5–6 mm, blue-gray or blue-violet at maturity; seeds 0.5 mm long, ovoid, obscurely rugulate or granulate.

Phenology. Flowering collections have been made from January through May and in September and October; fruiting material has been collected from February through May and in August and September.

Distribution. Locally common in elfin forests and cloud forests from Nicaragua at Montaña Cuspire (Depto. Jinotega) and Isla de Ometepe (Depto. Rivas) to Costa Rica's Cordillera de Tilarán, Cordillera Central, and Cerros de Escazú at 400–2200 m.

This variety is distinguished by its conspicuously serrulate leaf blades that are 3-nerved or 3-plinerved. Nicaraguan populations (*Pipoly 5955* and *6042*, both at CAS) from Cerro La Pimienta (Zelaya) and *Pipoly 5164* (CAS) from Cerro El Hormiguero (Zelaya) superficially resemble this variety in having elliptic leaf blades that are sparsely lepidote abaxially, but the foliar margins are obscurely serrulate and the anthers on the meager material available for study appear to be 2-celled. Study of the few flowers on *Pipoly 6042* are also suggestive of dioecism. If examination of better material confirms this observation, these puzzling collections should also be compared with *M. glaberrima* (Schlechtendal) Naudin of southern Mexico and northern Central America.

Representative specimens examined. NICARAGUA. **Jinotega:** Montaña Cuspire; *Moreno 8028* (CAS). **Rivas:** ladera N del Volcán Concepción, Isla de Ometepe, *Martínez et al. 1522* (CAS, MEXU); Isla de Ometepe, Lago de Nicaragua, N slope of Volcán Maderas, *Neill & Vincelli 3304* (CAS). COSTA RICA. **Alajuela:** Palmira, *Smith NY527* (CAS, NY); Monteverde, road from Cerro Plano to Cerro Amigos, *Penneys 1490* (CAS, FLAS). **Heredia:** headwaters of Río Santo Domingo, ca. 3 km E of San Rafael de Vara Blanca, N slope of Volcán Barva, *Grayum et al. 7150* (CAS, CR, MO); Reserva Cerro Chompipe, *Umaña & Chacón 546* (CAS, CR); ca. 2 km SE of jct. CR 120 & CR 9 on CR 9, ca. 3 km south of Varablanca, *Utley & Utley 4392* (CAS, DUKE). **Puntarenas:** Cordillera de Tilarán. Monteverde Cloud Forest Res., *Almeda & Daniel 4864* (CAS, CR). **San José:** 6 km NE of Cascajal, *Almeda & Nakai 4864* (CAS, CR); ca. 5 km WSW of Aserrí along

upper slopes and summit of Cerro Daser, *Almeda & Nakai 3678* (CAS, CR).

Tibouchina tortuosa (Bonpland) Almeda, comb. nov. Basionym: *Rhexia tortuosa* Bonpland, Monogr. Melast. 2: 17, pl. 7. 1806–1808. *Osbeckia tortuosa* (Bonpland) Sprengel, Syst. Veg. 2: 312. 1825. *Chaetogastra tortuosa* (Bonpland) DC., Prodr. 3: 132. 1828. *Oreocosmus tortuosus* (Bonpland) Naudin, Ann. Sci. Nat. Bot. 3, 13: 38. 1850. TYPE: Mexico. Guerrero: Taxco (as Tasco), *A. Bonpland s.n.* (holotype, P; isotype, P [2]).

Pleroma mexicanum DC., Prodr. 3: 152. 1828. TYPE: Mexico. without exact locality, *M. Sessé & J. Mociño s.n.* (holotype, OXF, photos, CAS, F, US).

Suffrutescent herb or slender shrub 0.5–1.5 m tall; distal branches quadrate, rounded with age, the internodes and petioles moderately covered with appressed simple trichomes 1–4 mm long. Leaves of a pair somewhat unequal in size, petioles 2–14 mm long; blades 2.9–9 × 1–3.4 cm, elliptic to elliptic-lanceolate, apex acuminate, base acute, margin inconspicuously ciliate-serrulate, 3- to 5-nerved, adaxially moderately strigose, abaxially moderately covered with appressed indument of smooth trichomes on and between the primary veins. Inflorescence a simple or once-compound cyme but commonly reduced to paired or solitary flowers on pedicels 2–4 mm long; bracteoles 3–6 (–10) × 0.5–3 mm, narrowly elliptic to oblong, sparingly strigose on both surfaces, entire, ciliate, and early deciduous. Calyx lobes 5–8 × 0.75–1 mm, ciliate, sparingly beset with a few simple trichomes on both surfaces; petals 10–15 × 8–11 mm, lavender, the margin ciliate, the cilia often gland-tipped; large stamens, with filaments 5.5–6 mm long, anthers 3.5–6 mm long, subulate, reddish-purple; connective prolonged 1.5–3.5 mm below anther sacs, expanded dorsally near filament insertion into a minute lobule and ventrally into a yellow bilobed appendage 0.5–1 mm long; small stamens, with filaments 5–7 mm long, anthers 2–5.5 mm long, linear-oblong, yellow, connective prolonged 0.25–0.5 mm below anther sacs, the yellow shallowly bilobed ventral appendage 0.25–0.5 mm long; style 8–9 mm long. Fruiting hypanthia 6–7 × 4–5 mm, subcylindric to suburceolate, moderately covered with appressed to antrorsely spreading smooth hairs 0.5–2 mm long; seeds 0.25–0.5 mm long, cochleate, the testa tuberculate.

Phenology. Flowering specimens have been collected from January through April and from July through December; fruiting collections have been made from January through April, July, and from August through October.

Distribution. Locally common on slopes with mesophytic montane forests with *Fraxinus* L., *Pinus* L., and *Quercus* L. in southern Mexico from Michoacán, Querétaro, and Hidalgo disjunctly south to Chiapas at 950–1950 m.

The name *Tibouchina mexicana* Cogniaux has long been attributed to this species (Cogniaux, 1891; Standley, 1924). Because it is based on the same type as *T. tortuosa*, it is illegitimate and must be rejected since it was nomenclaturally superfluous when published. There has been no previous attempt to identify the earliest epithet for this species. Cogniaux did not give a date of publication for *Rhexia tortuosa* in his familial monograph and Standley erroneously lists the publication date as 1823, the same year that D. Don described this entity as *Melastoma mexicanum*, a later homonym that is also illegitimate. According to Stafleu and Cowan (1979: 369), *Rhexia tortuosa* was published sometime between 1806 and 1808, which gives it undisputed priority. I have examined the types of *R. tortuosa* at P and these together with the plate that accompanies the protologue leave no doubt that what have passed as *Pleroma mexicanum* and *Tibouchina mexicana* are clearly identical.

Tibouchina tortuosa and *T. rufipilis* (Schlechtendal) Cogniaux form a closely related species pair characterized by narrowly oblanceolate or linear-spatulate calyx lobes and dimorphic stamens. Typical *T. tortuosa* has a sparse covering of appressed trichomes on upper cauline internodes, whereas *T. rufipilis* usually has a denser cover of spreading internodal trichomes. Both species appear to be restricted to southern Mexico, but judging from available collections, the latter is less common and seems to have a range that is more eastern and centered in the states of Querétaro, Hidalgo, and Veracruz (Almeda, 1993). Posture and density of cauline pubescence is known to be an unreliable taxonomic character among species complexes elsewhere in the family. I have refrained from combining these two species, however, until the variation can be evaluated as part of a comprehensive revisionary study. If these two species prove to be conspecific, *T. tortuosa* is the epithet that has priority.

Representative specimens examined. MEXICO. **Chiapas:** mun. Tenejapa in the paraje Oshe Wits, *Breedlove 7764A* (DS, ENCB). **Hidalgo:** mun. Molango, 6 km SW of Molango, *Breedlove & Almeda 59449* (CAS); along Hwy. 105 betw. Huejutla & Molango, 11.5 mi. N of Ajacaya S. Cristobal & 12.6 mi. N of jct. road to Otongo, *Daniel 395* (CAS, MICH). **México:** mun. Tejupilco, 1 km al W de

Nanchititla, *Rzedowski 22104* (CAS, ENCB). **Michoacán:** entre Las Trincheras y El Puerto de Laureles, aprox. 21 km al SW de Zitácuaro, *Soto et al. 2658* (CAS, MEXU). **Morelos:** by streams near Cuernavaca, *Pringle 8021* (CAS, MEXU). **Puebla:** mun. Necaxa, along lake shore at Nuevo Necaxa, *Breedlove & Almeda 59593* (CAS). **Querétaro:** mun. Landa, 2 km al Noroeste de Neblinas, *Rubio 1175* (CAS, IEB); mun. Jalpan, 4–5 km al Poniente de La Parada, *Servín 324* (CAS, IEB).

Acknowledgments. Field studies were supported, in part, by U.S. National Science Foundation Grants DEB 76-83040, DEB 78-25620, BSR 86-14800 (*Flora Mesoamericana*), and the G. Lindsay Field Research Fund of the California Academy of Sciences. Logistical support was provided by the Universidad Autónoma de México, Museo Nacional de Costa Rica, Instituto Nacional de Biodiversidad, Costa Rica, Smithsonian Tropical Research Institute, and the University of Panama. The assistance of several colleagues has advanced my research on Mesoamerican Melastomataceae in many ways. I am especially grateful to the following: D. E. Breedlove, M. Correa, T. Daniel, G. Davidse, G. de Nevers, M. Grayum, B. Hammel, R. Kriebel, G. McPherson, J. Rzedowski, D. Stevens, and N. Zamora. The illustrations were prepared by Meg Stalcup (Figs. 1, 2, 5) and Hana Pazdírková (Figs. 3, 4). I also thank the curators and staffs of the following herbaria for loans, gifts of specimens, or assistance during study visits: BM, BR, C, CAS, CR, DS, DUKE, ENCB, F, FLAS, G, IEB, INB, K, LL, MA, MEXU, MICH, MO, NY, OXF, P, PMA, S, SCZ, TEX, and US.

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Nomenclatural Notes on Eurasian *Arabis* (Brassicaceae)

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ABSTRACT: Two new generic names (*Catolobus* and *Pseudoturritis*) and four new combinations (*Boechera falcata*, *C. pendula*, *P. turrita*, and *Rhammatophyllum fruticulosum*) are proposed. Morphological characters supporting the assignment of seven Eurasian species of *Arabis* to *Boechera*, *Catolobus*, *Fourraea*, *Pseudoturritis*, *Rhammatophyllum*, and *Turritis* are discussed in connection with molecular or cytological data. A key to these Eurasian segregates of *Arabis* is presented.

Key words: *Arabis*, *Boechera*, Brassicaceae, *Catolobus*, *Fourraea*, *Pseudoturritis*, *Rhammatophyllum*, *Turrita*, *Turritis*.

Until recently, *Arabis* L. was considered to include as many as 180 species distributed in the temperate areas of the northern hemisphere (Al-Shehbaz, 1988). No comprehensive account of the entire genus exists, though regional floristic and monographic works are numerous (see under Literature Cited). Schulz (1936) synthesized earlier works and presented a detailed classification of *Arabis* that included 16 sections, of which 10 were either monotypic or ditypic. Schulz's sectional classification was highly artificial because it included species now assigned to *Arabidopsis* Heynhold, *Boechera* Á. Löve & D. Löve, *Catolobus* (C. A. Meyer) Al-Shehbaz, *Crucihimalaya* Al-Shehbaz et al., *Draba* L., *Fourraea* Greuter & Burdet, *Pseudoturritis* Al-Shehbaz, *Rhammatophyllum* O. E. Schulz, *Sibara* Greene, and *Streptanthus* Nuttall.

Previous botanists who worked on *Arabis* delimited the genus primarily on having linear, latiseptate fruits (flattened parallel to the septum), branched trichomes, and accumbent cotyledons. However, this character combination evolved independently more than 25 times in the Brassicaceae (Al-Shehbaz, 2003). Molecular data (Koch, 2003; Koch et al., 1999, 2000, 2001; Kropf, 2002; O'Kane & Al-Shehbaz, 2003; Price et al., 2001; Beilstein, pers. comm.) and morphological studies (Al-Shehbaz, 2003) have clearly demonstrated that all recent North American, European, and Asian authors (see below) have recognized *Arabis* as a polyphyletic genus consisting of many unrelated taxa. For example, the delimitation of *Arabis* by North American authors (e.g., Hopkins, 1937; Rollins, 1941, 1993; Mulligan, 1996) included species presently placed in *Arabidopsis*, *Boechera*, *Pennellia* Nieuwland, *Streptanthus*, and *Turritis* L. By contrast, *Arabis* sensu European authors (e.g., Jones & Akeroyd, 1993; Talavera, 1993; Jalas & Suominen, 1994; Tan, 2002) included species of *Arabidopsis*, *Diplotaxis* DC., *Draba*, *Fourraea*, *Turritis*, and *Pseudoturritis*, whereas that of Asian authors (e.g., Busch, 1939; Zhou et al., 2001) included species of *Arabidopsis*, *Boechera*, *Catolobus*, *Crucihimalaya*, *Parryodes* Jafri, *Pseudoturritis*, *Rhammatophyllum*, *Transberingia* Al-Shehbaz & O'Kane, and *Turritis*.

Arabis s. str. consists of species (all with $x = 8$) that have white to lavender or rarely purplish flowers, ebracteate racemes, erect to ascending or divaricate (never reflexed or secund) fruits, auriculate or rarely short-petiolate cauline leaves, and basal and lower cauline leaves with stalked stellate trichomes sometimes mixed with fewer, simple or forked trichomes (see key).

The present paper deals with the generic placement of seven Eurasian species previously assigned to *Arabis* (*A. brassica*, *A. fruticulosa*, *A. glabra*, *A. laxa*, *A. pendula*, *A. turczaninowii*, *A. turrita*; see below for synonymy and author attribution) and proposes generic placements based on molecular and cytological data combined with a critical evaluation of morphology.

BOECHERA

As delimited by Al-Shehbaz (2003), *Boechera* is a well-defined North American genus of more than 65 species (present estimate approaches 100) all with a base chromosome number of $x = 7$, fruits that are falcate, secund, pendent, or strongly reflexed, and trichomes that are dendritic, irregularly forked, sessile, malpighiaceous, simple or totally lacking. All *Boechera* species were previously placed in *Arabis* (Rollins, 1993; Mulligan, 1996), but the latter genus has a base chromosome number of $x = 8$, fruits that are straight, ascending to divaricate but never secund, and trichomes that are

primarily stalked and stellate. Species presently assigned to *Arabis* that do not have this character combination are anomalous in the genus and should be transferred to other genera. In fact, *Arabis* s. str. is most closely related to *Draba*, whereas *Boechera* belongs to an unrelated North American lineage (including *Anelsonia* J. F. Macbride & Payson, *Cusickiella* Rollins, *Phoenicaulis* Nuttall, *Polyctenium* Greene) that diverged from *Arabis* s. str. about 19–25 million years ago (Koch et al., 2001; Mitchell-Olds et al., 2005). Except for the following species, the remainder of *Boechera* is restricted to North America.

Boechera falcata (Turczaninow) Al-Shehbaz, comb. nov. Basionym: *Turritis falcata* Turczaninow, Bull. Soc. Imp. Naturalistes Moscou 13: 63. 1840. *Arabis falcata* (Turczaninow) Berkutenko, Bot. Zhurn. (Moscow & Leningrad) 61: 1597. 1976, non *A. falcata* Michaux, Fl. Bor. Amer. 2: 31. 1803, nec *A. falcata* A. Richard, Tent. Fl. Abyss. 1: 17. 1847. *A. turczaninowii* Ledebour, Fl. Rossica 1: 123. 1841. TYPE: Russia. Kamchatka: Ochotensem, between Czernoliesk and Allach-Jun, 1835, *Ilia Kuznetzoff s.n.* (holotype, LE).

Boechera falcata, a species restricted to the Russian Far East and adjacent Siberia, was correctly recognized by Yurtsev & Zhukova (1972), Berkutenko (1988), and Doronkin (1994) as *Arabis turczaninowii*. Ledebour (1841) proposed *A. turczaninowii* as a new name to avoid creating a later homonym by the transfer of *Turritis falcata* to *Arabis* (see synonymy above). Chromosome counts for *B. falcata*, all agreeing on $2n = 14$, were listed as *A. falcata* by Berkutenko and Gurzenkov (1976) and as *A. turczaninowii* Ledebour by Yurtsev and Zhukova (1972) and Zhukova and Petrovsky (1984). The species has falcately pendent fruits and indumentum of primarily dendritic trichomes. Therefore, both cytological and morphological data clearly support its placement in *Boechera*, a disposition representing the first report of the genus from Asia. It is interesting to note that Schulz (1936) placed *B. falcata* (as *A. turczaninowii*) and the North American *B. holboellii* (Hornemann) Á. Löve & D. Löve (as *A. holboellii* Hornemann) in the ditypic section *Arabis* sect. *Campylocarpus* C. A. Meyer, but such a very close relationship was not acknowledged by subsequent authors.

CATOLOBUS

This name was originally proposed by Meyer (in Ledebour, 1831, p. 20) as a monotypic section of *Arabis* and was maintained as such by Schulz (1936). Subsequent workers, however, did not recognize this section. Meyer (in Ledebour, 1831) distinguished section *Catolobus* and its type, *A. pendula* L., from section *Arabis* (as sect. *Euarabis*) by having sepals equal and non-saccate instead of unequal and saccate, fruits pendulous instead of erect or ascending, absence instead of presence of median nectar glands, and funicles adnate to septum instead of free from it. A closer examination of *Arabis* s. str. worldwide shows that the differences in fruit orientation and the adnation of funicles to septum are reliable and consistent to distinguish *Arabis* s. str. and segregate genera, but those of the nectar glands and sepals are not. Furthermore, the abaxial leaf surface of *A. pendula* has sessile, appressed, 3- to 6-rayed stellate trichomes with one ray perpendicular to the surface. To my knowledge, this type of trichomes is not found in any species previously placed in *Arabis*. The indumentum in *Arabis* s. str. consists of stalked, stellate trichomes rarely mixed with forked or simple ones.

Molecular data (O'Kane & Al-Shehbaz, 2003) show that *Arabis* s. str. is remotely related to *A. pendula*, a species nested within a well-supported clade that includes *Capsella bursa-pastoris* (L.) Medikus, *Neslia paniculata* (L.) Desvaux, *Camelina microcarpa* Andrzejowki ex DC., and *Pseudoarabidopsis toxophylla* (Bieberstein) Al-Shehbaz, O'Kane & R. A. Price. Furthermore, chromosome counts (Berkutenko & Gurzenkov, 1976) show that *A. pendula* is a triploid with $2n = 21$. All species of *Arabis* s. str. are diploid (or rarely tetraploid) based on $x = 8$ (Al-Shehbaz, 2003). Berkutenko et al. (1984) also reported $2n = 16$ and $2n = 21$ for the species from the same population, but such discrepancy in chromosome number needs confirmation, and further cytological studies on *A. pendula* are certainly needed before a meaningful conclusion is reached. Therefore, molecular and morphological data support the removal of *A. pendula* to a genus of its own, and *Arabis* sect. *Catolobus* is elevated herein to the generic rank to accommodate that disposition.

Catolobus (C. A. Meyer) Al-Shehbaz, stat. et comb. nov. Basionym: *Arabis* sect. *Catolobus* C. A. Meyer, in Ledebour, Fl. Altaica 3: 20. 1831. TYPE: *Catolobus pendula* (L.) Al-Shehbaz.

Herbs biennial; trichomes simple and setose, mixed with smaller, sessile, appressed, stellate, often 3- to 6-rayed ones usually with 1 ray perpendicular to the surface; stems erect to ascending,

often much branched above. Basal leaves petiolate, often withered by anthesis; cauline leaves sessile, upper ones auriculate, entire or serrulate to dentate. Racemes ebracteate, often in panicles, elongated considerably and sometimes secund in fruit; fruiting pedicels slender, ascending to reflexed. Sepals oblong, deciduous, erect, equal; petals white or rarely pink, oblong to oblanceolate, not differentiated into blade and claw; stamens 6, slightly tetradynamous, unappendaged; anthers oblong; nectar glands confluent, subtending or surrounding bases of all stamens, rarely median nectaries absent; ovules 70 to 110 per ovary. Fruit dehiscent, linear, strongly latiseptate, straight, widely spreading to reflexed; valves often with a distinct midvein, glabrous or rarely sparsely pubescent, smooth; gynophore obsolete; replum rounded; septum complete; style obsolete or less than 1 mm long; stigma capitate, entire; seeds uniseriate or biseriate, winged all around or only distally, oblong, ovate, or suborbicular, flattened; funicles adnate at base to septum; cotyledons accumbent.

Catolobus pendula (L.) Al-Shehbaz, comb. nov.

Basionym: *Arabis pendula* L., Sp. Pl. 2: 665. 1753. TYPE: Siberia, no collector name given (lectotype designated by Boczantzeva (1997: p. 116), Herb. Linn. No. 842.13, LINN).

Zhou et al. (2001) indicated that the species (as *Arabis pendula*) is highly variable in the development of seed wing, arrangement of seeds per locule, and density of indumentum. Because of the discrepancy in its chromosome number (Berkutenko et al., 1984) and its tremendous morphological, ecological, and altitudinal variation (Zhou et al., 2001), the species is much in need of detailed studies throughout its range. *Catolobus pendula* is widely distributed in European Russia eastward into central Asia, China, the Russian Far East, and Japan (Zhou et al., 2001).

Fourraea

Although this monotypic genus was established two decades ago by Greuter and Raus (1984), it has not yet received the recognition it deserves. It differs from *Arabis* s. str. by being completely glabrous and strongly glaucous and by having somewhat fleshy leaves, long-petiolate basal leaves, subterete fruits, and a chromosome number of $2n = 14$ (Burdet, 1967). All other species of *Arabis* are non-glaucous and otherwise have stellate trichomes, short-petiolate to subsessile and nonfleshy basal leaves, flattened fruits, and a base chromosome number $x = 8$ (Al-Shehbaz, 2003). The type species, *Fourraea alpina* (L.) Greuter & Burdet, is known in *Arabis* as *A. brassica* (Leers) Rauschert and also, erroneously, under the illegitimate *A. pauciflora* (Grimm) Garcke (see Greuter et al., 1986). The species is distributed in southern Europe from the Iberian Peninsula eastward into Yugoslavia (Jones & Akeroyd, 1993). Talavera and Velayos (1992) reduced *Fourraea* to a monotypic section of *Arabis*, whereas Schulz (1936) placed this single species (as *A. pauciflora*) in the invalid (nomen nudum) *Arabis* sect. *Brassicoturritis* O. E. Schulz. Molecular data (Koch et al., 1999, 2000; Koch, 2003), as well as cytological and morphological data above, strongly support the maintenance of *Fourraea* and amply demonstrate that its single species is unrelated to *Arabis* s. str.

Pseudoturritis

Arabis turrita L., another anomalous element widely recognized in *Arabis*, is distributed in Europe (Jones & Akeroyd, 1993; Jalas & Suominen, 1994), Turkey, Caucasus, and adjacent Russia (Cullen, 1965), and Algeria, Israel, Lebanon, and Syria (Greuter et al., 1986). It is readily distinguished from all Eurasian and North American *Arabis* by its yellow flowers, fully bracteate racemes (rarely bracteate only along lower half), and secund, strongly falcate, deflexed fruits (8–)10–15 cm long and with prominently thickened margins. By contrast, *Arabis* has white or pink to purple flowers, ebracteate racemes, and non-secund, straight, erect to divaricate fruits 1–4(–5) cm long and with unthickened margins.

Molecular data (Koch et al., 1999, 2000; Koch, 2003; Kropf, 2002) demonstrate that *Arabis turrita* forms a clade well separated from that including *Draba*, *Aubrieta* Adanson, and *Arabis* s. str. These findings, along with the significant morphological differences above and those used by Al-Shehbaz (2003) to delimit *Arabis* s. str., strongly support the placement of *A. turrita* in a genus of its own.

Wallroth (1822) proposed the generic name *Turrita* to include two species originally described by Linnaeus (1753) in *Arabis*, *A. pendula* and *A. turrita*. He renamed the latter species as *T. major* Wallroth, a name that should be used if *Turrita* were to be maintained. However, this generic name has recently been rejected as a later homonym of *Turritis* (see Brummitt, 2005). Although Bubani (1901) expanded *Turrita* to include 12 additional species from *Arabis*, his broader delimitation was not followed by subsequent botanists, and at best *Turrita* has since been recognized as a monotypic section of *Arabis* (Schulz, 1936; Talavera & Velay-

os, 1992). Based on the recommendation by the Committee on Spermatophytes (Brummitt, 2005: pp. 535–536), a new monotypic genus *Pseudoturritis* is proposed to accommodate *A. turrita*.

Psuedoturritis Al-Shehbaz, gen. nov. TYPE: *P. turrita* (L.) Al-Shehbaz.

Herba perennis; pili stipitati, stellati; folia caulina sessilia, cordato-auriculata vel amplexicaula; racemi bracteati, valde elongati, petala luteola, spathulata; stamina 6, tetradynama; ovula 50 ad 80; fructus lineares, secundi, compressi, falcati, (8–)10–16 cm longi; septum completum; semina uniseriata, oblonga, alata, compressa; cotyledones accumbentes.

Short-lived perennial herbs, rarely biennial, pubescent with stalked stellate trichomes mixed with fewer forked ones; stems erect, simple or few branched above. Basal leaves rosulate, petiolate, dentate, often withered by anthesis; cauline leaves sessile, cordate-auriculate to amplexicaul at base, denticulate. Racemes bracteate throughout or rarely along lower half, elongated considerably in fruit; rachis straight; fruiting pedicels erect and appressed or ascending. Sepals oblong, deciduous, erect, not saccate; petals pale yellow, spatulate, clawed; stamens 6, tetradynamous, unappendaged; anthers oblong; nectar glands confluent, lateral ones strongly developed, cup-shaped, median glands confluent with lateral ones; ovules 50 to 80 per ovary. Fruit dehiscent, linear, strongly latiseptate, secund, strongly falcate, deflexed, (8–)10–16 cm long; valves with a distinct midvein and prominently thickened marginal veins, glabrous or pubescent; replum rounded, straight or constricted between seeds; septum complete; style distinct, to 2 mm long; stigma capitate entire; seeds uniseriate, winged all around, oblong, flattened; funicles basally adnate to septum; cotyledons accumbent.

Pseudoturritis turrita (L.) Al-Shehbaz, comb. nov. Basionym: *Arabis turrita* L., Sp. Pl. 2: 665. 1753. TYPE: "Brassica sylv. albido flore nutante siliqua" in Boccone, Museo di Piante: tab. 72. 1697 (lectotype, designated by Al-Shehbaz & Turland, in Cafferty & Jarvis, 2002: p. 531).

Epitype. [Italy]. Toscana, La Verna, 27 May 1956, *Corradi s.n.* (FI).

RHAMMATOPHYLLUM

Rhammatophyllum consists of nine species distributed in Afghanistan, Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, and the Mongolian Altai (Al-Shehbaz & Appel, 2002; Kamelin, 2002). All species are shrubs with malpighiaceous, submalpighiaceous, or rarely subdendritic trichomes, entire leaves, apiculate anthers, flattened and linear fruits, torulose valves with a distinct midvein, often sessile and coarsely capitate stigmas, and oblong, flattened, and usually winged seeds (Al-Shehbaz & Appel, 2002). Species of *Arabis* are always herbs with stalked stellate trichomes, distinct styles, and entire stigmas often less in diameter than the style.

A tenth species of *Rhammatophyllum*, *R. fruticulosum*, was originally described by Meyer (in Ledebour, 1831) as a species of the monotypic section *Arabis* sect. *Dendroarabis* C. A. Meyer. Schulz (1936) maintained that section, and the species remained there to the present. For reasons discussed below, the species is transferred herein to *Rhammatophyllum*.

Rhammatophyllum fruticulosum (C. A. Meyer) Al-Shehbaz, comb. nov. Basionym: *Arabis fruticulosa* C. A. Meyer, in Ledebour, Fl. Altaic. 3: 19. 1831. TYPE: "In rupestribus montium Kurtschum pr. Nabaty," 10 June 1826, *C. A. Meyer s.n.* (lectotype, designated by Botschantzev, 1968: 144, LE).

Rhammatophyllum fruticulosum is widely distributed in China (Xinjiang), Kazakhstan, Kyrgyzstan, Mongolia, Pakistan, Russia, and Tajikistan (Zhou et al., 2001). Although the species has been maintained in *Arabis* to the present, it is quite anomalous in this genus. It consists of shrubs to 50 cm tall and has dendritic trichomes, petiolate leaves, pubescent fruits, and large stigmas nearly as wide as the fruit. None of these characters occurs in *Arabis* s. str. as delimited by Al-Shehbaz (2003), and except for trichome morphology, the species fits exceptionally well in *Rhammatophyllum*. Although the trichomes in *Rhammatophyllum* are malpighiaceous or submalpighiaceous, in *R. afghanicum* (K. H. Rechinger) Al-Shehbaz & O. Appel they are a mixture of subdendritic and fewer submalpighiaceous ones, and in the related *R. fruticulosum* they are exclusively dendritic. These two species can also be separated by their fruits and seeds. In *R. fruticulosum* the fruits are 1–2 mm wide and the seeds are narrowly winged (wing to 0.1 mm wide), whereas in *R. afghanicum* the fruits are (2.5–)3–4.5 mm wide and the seeds are broadly winged (wing 0.5–1 mm wide). Such a slight difference in trichome morphology should not be alarming because many genera in the Brassicaceae (e.g., *Alyssum* L., *Draba* L., *Boechera*) exhibit tremendous trichome diversity (Al-Shehbaz, 2002; Appel & Al-Shehbaz, 2003).

Turritis

The status of *Turritis* has fluctuated in the various floristic and monographic accounts between acceptance and reduction to synonymy of *Arabis*. The literature dealing with the genus and its type species, *T. glabra* L. (= *A. glabra* (L.) Bernhardi), is too voluminous to cite, and the interested reader should consult the references on *Arabis* for leads (e.g., Al-Shehbaz, 2003). The genus includes two species, of which the type, *T. glabra*, is widely distributed in Eurasia and North America (Rollins, 1993). The second species, *T. laxa* (Smith) Hayek (= *A. laxa* Smith), is confined to the eastern Mediterranean (Iraq, Israel, Lebanon, Syria, Turkey), Caucasus, Yugoslavia, and Greece (Townsend & Guest, 1980; Jones & Akeroyd, 1993; Tan, 2002).

Every molecular marker used in the study of *Arabis* s.l. (e.g., Koch, 2003; Koch et al., 1999, 2000, 2001; Kropf, 2002; O'Kane & Al-Shehbaz, 2003) clearly demonstrates that *Turritis glabra* has no close affinity to *Arabis* except for being a remotely related mustard. The placement of this species in *Arabis* would enforce the recognition of a polyphyletic genus, a position with which I disagree.

Key to Genera of Eurasian Species Previously Placed in *Arabis*

1a. Racemes bracteate throughout or at least along lower half; flowers pale yellow; fruits (8–)10–16 cm long, margin conspicuously thickened . . . . . *Pseudoturritis*

1b. Racemes ebracteate; flowers white, pink, or purple (pale yellow in *Turritis glabra*); fruits less than 8 cm long (8–12 cm in *T. laxa*), margin not thickened.

2a. Shrubs; fruits densely pubescent; stigma distinctly wider than style; leaves linear to oblanceolate, petiolate, not auriculate at base . . . . . *Rhammatophyllum*

2b. Herbs; fruits glabrous, rarely sparsely pubescent; stigma narrower than style; leaves of various other shapes, sessile, base auriculate or amplexicaul, rarely cuneate.

3a. Plants glaucous; racemes and upper cauline leaves glabrous.

4a. Perennials; seeds wingless; basal leaves long petiolate, persistent; trichomes exclusively simple, restricted to petioles of basal leaves, petals white, rarely pink . . . . . *Fourraea*

4b. Biennials; seeds winged; basal leaves short petiolate to subsessile, withered at anthesis; at least some trichomes stalked and forked; petals pale yellow or pink . . . . . *Turritis*

3b. Plants not glaucous; racemes and upper leaves variously pubescent.

5a. Trichomes stalked stellate, rarely malpighiaceous; fruits erect to ascending, rarely divaricate . . . . *Arabis*

5b. Trichomes dendritic, forked, sessile stellate, or setose; fruits deflexed or rarely divaricate (Eurasia).

6a. Trichomes non-setose, dendritic, sometimes also stalked forked (simple in some North American species); fruits (Asia) strongly falcate, not secund; lower cauline leaves sessile . . . . . *Boechera*

6b. Trichomes setose, simple, those on leaves mixed with sessile, appressed stellate ones with one ray perpendicular to leaf surface; fruits straight, secund; lower . . . cauline leaves petiolate . . . . . *Catolobus*

Acknowledgments. I am grateful to Richard K. Brummitt, Gerrit Davidse, and Nicholas J. Turland for advice on nomenclatural matters, as well as to Charlie E. Jarvis and Steve Cafferty for typification of some Linnaean names in *Arabis*. I am indebted to Olga Cherneva, Vladimir Dorofeyev, and Alexander Sennikov for their help in locating the types of some species at LE, and to Tatyana Shulkina for translating some of the Russian literature. Last, but not least, I thank Victoria C. Hollowell for editorial advice and critical checking of the manuscript.

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Agave valenciana (Agavaceae), a Gigantic New Species from Jalisco, Mexico

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ABSTRACT. *Agave valenciana* (Agavaceae), a new species from Jalisco, western Mexico, is described and illustrated. This species is endemic to a small section of the canyons of the Mascota and Talpa rivers. It belongs to the *Agave* subgenus *Agave* L. and to the Marmoratae species group. It appears to be closely related to *A. marmorata* Roezl from Puebla and Oaxaca. It differs from the latter in having a much larger rosette diameter, it has fewer but longer and wider leaves, much larger flowers, and it grows in less arid environments. This discovery has implications for "raicilla" production, an alcoholic tequila-like beverage traditionally manufactured in western Jalisco, Mexico.

RESUMEN. Se describe y se ilustra *Agave valenciana* (Agavaceae), una especie nueva de Jalisco, en el occidente de México. Esta especie es endémica de una porción de las cuencas de los ríos Mascota y Talpa. Pertenece al subgénero *Agave* L. y al grupo Marmoratae. Su pariente más cercano parece ser *A. marmorata* Roezl de Puebla y Oaxaca. Difiere de esta última en tener un mayor diámetro de roseta, menos hojas pero más largas y anchas, flores más grandes y crece en ambientes menos áridos. Este descubrimiento tiene implicaciones en la producción de "raicilla", una bebida similar al tequila que se produce tradicionalmente en el oeste de Jalisco, México.

Key words: *Agave*, century plant, maguey, Marmoratae, mescal, Mexico, mezcal, raicilla.

An alcoholic tequila-like beverage, a type of mescal, called "raicilla" or "ximat" is traditionally prepared from *A. maximiliana* Baker ("lechuguilla") in rural highlands of western Mexico (Vázquez-García et al., 1995, 2004; Valenzuela Zapata, 2003). However, the "raicilla" is occasionally manufactured from, or mixed with, a different century plant called "maguey relisero" (Rafael Castillón & Oscar Valencia, pers. comm.). After examining wild populations of "maguey relisero" at Mascota, Jalisco, we could not place it in any currently recognized species. Thus, it is herein described as new.

Agave valenciana Cházaro & A. Vázquez, sp. nov. TYPE: Mexico. Jalisco: Mun. Mascota, Coamil del Naranjo, 7 km NW of Mascota, 20°35′N, 104°54′W, 1250 m, transition betw. tropical dry forest & oak forest, 25 Apr. 2004 (fl), *Y. L. Vargas-Rodriguez, M. Cházaro-B. & J. A. Vázquez-García 436* (holotype, IEB; isotypes, ENCB, GUADA, IBUG, MEXU, MO, WIS, XAL). Figures 1 and 2.

Herba simplex nonsurculosa, *A. marmoratae* affinis sed statura validiore et foliis et floribus grandioribus; rosulis usque 1.7–2.2 m altis, 2.7–3.3(4.1) m diametro; foliis 7 ad 15 rosulatis, 150–230 cm longis, 37–46(53) cm latis ad medium, atro-viridibus, supra pallide zonatis, viridibus vel glaucis notatis; inflorescentia cum scapo 5–6(7) m alta, floribus 50–60(70) mm longis intense luteis; capsulis 23–29 mm longis, 10–13 mm latis; seminibus 3–4.5 mm longis, 2–3 mm latis.

Perennial plant, solitary, not suckering, 5–6(7) m tall; rosettes 1.7–2.2 m high, 2.7–3.3(4.1) m diam., short-stemmed, with 7 to 15 leaves. Mature leaves 150–230 cm long, 37–46(53) cm wide in the middle, up to 30 cm wide at the base, up to 15 cm thick at the base, broadly lanceolate, in various at-

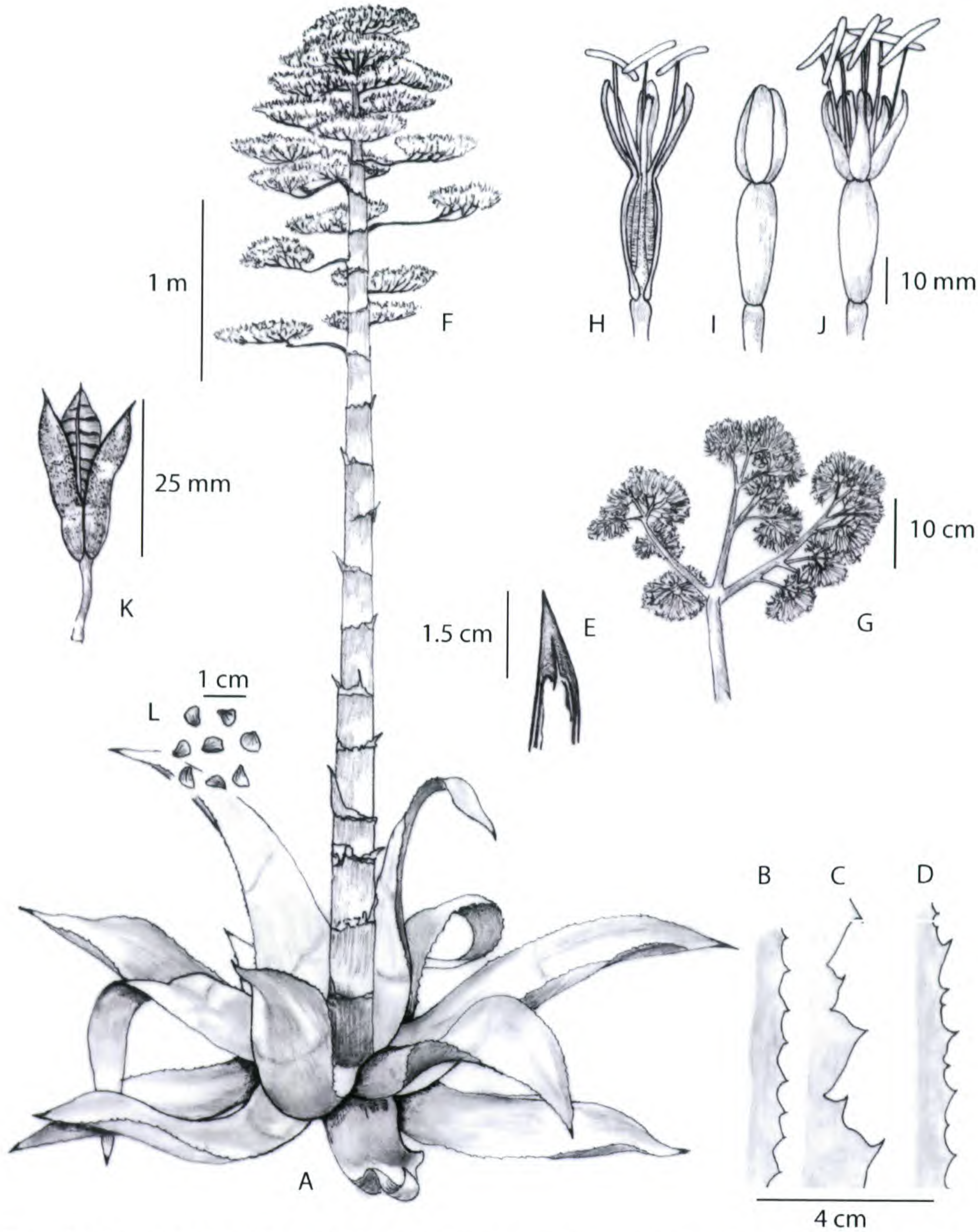

Figure 1. *Agave valenciana* Cházaro & A. Vázquez, line drawing based on *M. Cházaro et al. 8110* (IBUG). —A. Habit. —B–D. Leaf teeth at the base, middle, and top, from *Vargas-Rodriguez et al. 436* (IBUG). —E. Terminal spine, from *Vargas-Rodriguez et al. 436* (IBUG). —F. Inflorescence. —G. Flowering branch. —H. Flower in cross section. —I. Flower bud. —J. Mature flower. —K–L. Fruit and seeds, from *Vázquez-García et al. 7954* (IBUG).

titudes, thick, firm concave, dark green, slightly glaucous, smooth at lower and upper surface, cross-banded in both sides; margins frequently undulate, distinctly crenate at the middle to closely dentate at the ends, with mammae 4–6 × 5–19 mm; mammilliform teeth mostly 2–5(–7) mm, 5–17(22) mm apart, flattened, the cups from very broad bases 5–9(12) mm, mostly straight, some curved toward the

Figure 2. Distribution in Mexico of *Agave valenciana* and other species in the Marmoratae group (Gentry, 1982; Etter & Kristen, 2002).

base, dark brown to red-brown, interstitial teeth few or none; spine 10–15(20) mm long, usually short and conic, robust, rarely short-decurrent, dark brown to red-brown. Panicles 5–6(7) m high, shaft 12–35 cm diam. at the base, with 25 to 35 diffuse and flat-topped umbels in the upper half of shaft; bracts triangular, acute at the apex, variable in size along the shaft, spirally arranged, scarious, ca. 15 cm apart. Flowers 50–60(70) mm long, brilliant yellow, protandrous; ovary body 18–27 × 4–5 mm, light green, the neck 3–5 mm long and unconstricted; tube 5–7 mm long, 10 mm wide, somewhat funnelform; tepal 10–13 × 4–5 mm, linear, fleshy, erect, the apex galeate, yellow; filaments 34–38 mm long, inserted at 2–4 mm near base of tube, slender, yellow; anthers 10–17 mm long, centric, yellow. Capsules oblongoid 23–29 × 10–13 mm, slender stipitate, short-beaked, thin walled; carpels acute, 23–29 × 7–8 mm, curving outward for dehiscence; seeds triangular, but curved in one side, 3–4.5 × 2–3 mm, flat, membranous, light, black (Fig. 1).

Habitat. *Agave valenciana* thrives on steep slopes of basaltic rock in canyons that are part of the Mascota and Talpa watersheds, at the northwestern end of Sierra Madre del Sur. It is, so far, endemic to this region although the flora of much of this cordillera is not well known. *Agave valenciana* grows in the ecotone of tropical dry forest with oak forest, together with *Euphorbia tanquahuete* Sessé & Mociño, *Bursera* Jacquin ex L., *Ficus petiolaris* HBK, *Jacaratia mexicana* DC., *Plumeria rubra* L., *Agonandra racemosa* (DC.) Standley, *Euphorbia pulcherrima* Willdenow, *Quercus* L., *Pseudobombax ellipticum* HBK, *Cephalocereus alensis* (Weber) Britton & Rose, *Pedilanthus calcaratus* Schlechtendal, *Nopalea* Salm-Dyck, *Opuntia* Miller, *Mammillaria* Torrey & Gray, *Hechtia* Klotzsch, and *Pittocaulon phylliaris* McVaugh.

Phenology. Flowering from March to May; fruits dehiscing from September to November (Apolinar Gómez-Nuñez, pers. comm., 2004).

Common names. "Maguey relisero," "maguey marzeño," or "maguey manso" (Oscar Valencia, pers. comm.).

Distribution. So far, *Agave valenciana* is endemic to the steep and rocky canyons of the Mascota and Talpa rivers, both in western Jalisco, at 900–1250 m asl (Fig. 2). This species was recently observed, but not collected, 15 km west of the type locality, near El Mosco canyon, in the vicinity of the Talpa river. The authors observed less than 300 adult individuals near the type locality; however, further exploration in the entire extent of those canyons is urgently needed, especially at El Mosco area.

Conservation status. *Agave valenciana* deserves a protected status. This species has an adult mean density of 15 individuals per ha (Apolinar Gómez-

Nuñez, pers. comm.), it is not a suckering plant, and it is sometimes used for "raicilla" production. Thus, we propose its inclusion to the Mexican endangered species act (NOM-059-ECOL, 2001) under the Special Protection category. This category includes possible threatened species and promotes population recovery and habitat restoration.

Different conservation and reproduction efforts for *Agave valenciana* have arisen. Few plants have been grown successfully from seeds (Oscar Valencia, pers. comm.) and specific mature individuals have been spotted for seed collection during the early autumn of 2005. Apolinar Gómez-Nuñez, an agronomist and teacher at the CEBETA high school (Dirección General de Educación Tecnológica Agropecuaria-SEP, Mascota, Jalisco), is currently collaborating with the authors implementing demographic and pollination studies, seed collections, and germination experiments for *A. valenciana* conservation and cultivation purposes.

Studied populations were located on private properties; three of the landowners, Ramón Briseño, Miguel Esparza, and Margarita Nelson, are aware of the potential of this species and the need to protect it. For now, extraction of plants from habitat should be avoided to prevent ecosystem degradation. However, planned collection of seeds should be allowed to promote its reproduction in nurseries and its eventual introduction into cultivation.

Potential use and economic value. *Agave valenciana* is a remarkable addition to the succulent flora of western Mexico and deserves to be cultivated at least as an ornamental species because of its impressive size and its showy brilliant yellow flowers. Its potential for "raicilla" production is also promising but needs to be explored and evaluated. For instance, mature "heads" of *A. valenciana* used for "raicilla" production weight far over 350 kg (Manuel Salcedo Gutiérrez, pers. comm., 2004), at least three times heavier than those of *A. tequilana* Weber. *Agave valenciana* is known for having acceptable sugar content (Apolinar Gómez-Nuñez, pers. comm., 2004), and it is believed that the plants reach maturity in 15 years. To the best of our knowledge, the density of *A. valenciana* in the studied area is nearly 50 individuals per ha, with an adult density of 30%. Considering the extent of the two canyons (20 km to their convergence) and their relatively homogeneous habitat, we speculate that several thousands of adult individuals could exist in the area.

The social organization and infrastructure for promoting *Agave valenciana* as a new source of "raicilla" in western Jalisco already exist, since recently a Mexican board (Consejo Mexicano de Promoción de la Raicilla) for promotion of "raicilla" from *A. maximiliana* was established. This board is now headed by Manuel Salcedo-Gutiérrez and includes 37 board members, 22 distilleries, with over 50,000 plants and an annual "raicilla" production of 5,000 liters.

Eponymy. We are pleased to name this impressive century plant after Oscar M. Valencia-Pelayo, a talented amateur botanist who in the last five years has been engaged in the study and reproduction of trees and agaves of western Mexico.

Discussion. *Agave valenciana* belongs to the *Agave* subg. *Agave* L. and to the Marmoratae species group as assigned by H. S. Gentry (1982). Except for its much larger habit and leaves, this species shares most of the distinctive characteristics of the Marmoratae species group (Gentry, 1982), such as crenate margins, small terminal spines, small bright yellow flowers with small tubes 1/4 to 1/2 as long as the tepals and cross-banded leaves in both sides.

Agave valenciana is perhaps most related to *A. marmorata*, from Puebla and Oaxaca in Mexico, for having a robust habit, leaves much wider at the middle than at the ends, cross-banded in both sides, and marginal teeth spaced over 15 mm apart. The new species differs from the latter in having a much larger rosette diameter (cf. Table 1 for contrasting states in *A. marmorata*), fewer but longer and wider leaves, smaller spines, teeth, and capsules, and growing in less arid environments of western Jalisco in the transition between tropical dry forest and oak forest (Table 1). We also contrasted *A. gypsophila* H. S. Gentry and *A. nayaritensis* H. S. Gentry against *A. valenciana* (Table 1), since they occur in western Mexico and are members of the Marmoratae species group, sensu Gentry (1982). However the two are far smaller in habit, they are not distinctly wider at the middle of the leaves than at the ends, neither are the leaves cross-banded. Furthermore, they differ in geography and habitat (Gentry, 1982; McVaugh, 1989; Etter & Kristen, 2002).

The Marmoratae species group sensu Gentry (1982), with the addition of *Agave valenciana*, now includes six species and displays notable patterns of allopatric speciation, habitat specialization, and narrow endemism (Fig. 2). In Mexico, *Agave zebra* H. S. Gentry is only known from arid mountains in the Sonoran Desert (Gentry, 1982); *A. nayaritensis* H. S. Gentry is only known from moist tropical cliffs at Nayarit and Sinaloa (Etter & Kristen,

Table 1. Comparison of *Agave valenciana* Cházaro & A. Vázquez with morphologically and geographically related species of the Marmoratae species group (Gentry, 1982; Etter & Kristen, 2002).

Characters	*A. nayaritensis*	*A. gypsophila*	*A. marmorata*	*A. valenciana sp. nov.*
Rosette height & diam.	[0.8–1.1 × 1.5–2 m]*	[0.5–1 × 1–2 m]***	1.2–1.3 × 2 m	1.7–2.2 × 2.7–3.3(4.1) m
No. of leaves	[9–18(–40)]**	20–30	30–50	7–15
Leaf length & max. width	85–115 × 12–15 cm	45–100(110) × 7–12 cm	100–135 × 20–30 cm	150–230 × 37–46(53) cm
Leaf margin	Straight to undulate	Crenate with mammilliform teeth	Crenate, mammilliform teeth	Crenate, mammilliform teeth
Leaf strength & texture	Floppy/Asperulous	Fragile/scabrous****	Thick/roughly scabrous	Thick, firm/smooth
Leaf color	Light green	Glaucous gray [(-green)]****	Glaucous gray to light green	Dark green to slightly glaucous
Terminal spine	9–15[(–20)]** mm	5–15 mm	15–30 mm	10–15 (20) mm
Teeth size	1–3[(–4)]** mm	1–2 mm	6–12 mm	2–5(–7) mm
Marginal foliar teeth	10–15[(–20)]** mm apart	[5–10(20) mm apart]****	20–50 mm apart	5–17(22) mm apart
Inflorescence height	[(1–)]** 3–4 m	2–3 m	5–6.5 m	5–6(7) m
Flower length	40–45 mm•	30–35 mm••	40–48 mm•••	50–60(70) mm• 34–35(40) mm••
Ovary	20–25 mm	18–20 mm	20–25 mm	18–27 mm• 20 mm••
Tube	4 mm	4–5 mm	5–6 mm	5–7 mm• 4 mm••
Tepals	15–17 × 3–4 mm	10–11 × 3–4 mm	14–16 × 4 mm	10–13 × 4–5 mm• 10.5 × 3–4 mm••
Filament insertion	3–4 mm	1–2 mm	4.5–5 mm	2–4 mm• 2–3 mm••
Filaments	35–37 mm	20–25 mm	34–37 mm	34–38 mm• 27–33 mm••
Capsules	[16–25(28) × 10–14 mm]**	Unknown	40 × 16–18 mm	23–29 × 10–13 mm
Seeds	[5 × 3.5 × 1 mm]**	Unknown	Unknown	3–4.5 × 2–3 mm
Habitat	Volcanic cliffs	Gypsum soils and limestone	Limestone rocks	Volcanic basaltic cliffs
Vegetation cover	Mixed tropical forest	Thorn forest [deciduous forest]****	Oak woodland & short tree forest, [semiarid scrub]•••	Transition between tropical dry forest & oak forest
Distribution in Mexico	Nay.	Jal., Col., [Mich.]*** & Gro.	Pue., Oax.	Jal.
Elevation	[585–640]*(–670) m	360–914[(–1400)]*** m	1350–1830 m	900–1250 m

Most data obtained from Gentry (1982), otherwise indicated: * Mexico, Nayarit, Tepic, Mirador del Águila, *Cházaro B. et al. 8112* (IEB) and *8121* (IBUG). ** México: Nayarit, Escuinapa and Salto de Jumatán (Etter & Kristen, 2002). *** México: Michoacán, Coalcomán, Tehuantepec, *M. Cházaro et al. 8170* (IEB). **** After McVaugh (1989). • Measurements from fresh or pickled flowers. •• Measurements from dried flowers relaxed by boiling. ••• Determined from a picture, page 185: fig. 16 (García-Mendoza, 2002).

2002); *A. valenciana* Cházaro & Vázquez is only known from transitional tropical dry forest with oak forest on basaltic slopes at western Jalisco; *A. gypsophila* H. S. Gentry is known from limestone at the seaward facing slopes of Sierra Madre del Sur in Colima, Jalisco (but not from Manantlán as cited by Vázquez-García et al., 1995), Michoacán, and Guerrero (Gentry, 1982; McVaugh, 1989); *A. marmorata* Roezl is found in semiarid xerophytic scrub in Puebla and Oaxaca (Gentry, 1982); and *A. grijalvensis* B. Ullrich is endemic to the tropical dry forest at Cañón del Sumidero, Depresión Central de Chiapas (Ulrich, 1990).

Paratypes. MEXICO. **Jalisco:** Mun. Mascota, Coamil del Naranjo, 7 km NW of Mascota, 12 Apr. 2001, *M. Cházaro-B., O. Valencia-P. & I. Contreras-V. 8110* (IBUG); 25 Apr. 2004, *Y. L. Vargas-Rodriguez, M. Cházaro-B. & J. A. Vázquez-García 438* (IBUG); 25 Apr. 2004, *J. A. Vázquez-García, Y. L. Vargas-Rodriguez & M. Cházaro-B. 7829b* (IBUG); 18 Dic. 2004, *J. A. Vázquez-García, Y. L. Vargas-Rodriguez & Apolinar Gómez 7954* (IBUG).

Acknowledgments. We thank Rafael Castillón-López and Ramón Segura, both from Mascota, Jalisco, for providing information that led to the discovery of *A. valenciana*; Ramón Briseño, Apolinar Gómez, Ignacio Contreras, and Jesús Cortés for field assistance; Theodore S. Cochrane for preparing the Latin diagnosis; Refugio Vázquez for the line drawing; Eduardo Sahagún and Patricia Hernández de Cházaro for their valuable suggestions on the manuscript; Hirineo Martínez Barragán and Mario Alberto Ruiz López for their academic support.

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Resurrection of *Seutera* Reichenbach (Apocynaceae, Asclepiadoideae)

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ABSTRACT. The genus *Seutera* Reichenbach is resurrected to accommodate the taxa most frequently known as *Cynanchum angustifolium* Persoon, *C. palmeri* (S. Watson) S. F. Blake, and *C. peninsulare* S. F. Blake, for which the combinations *Seutera angustifolia* (Persoon) Fishbein & W. D. Stevens, *S. palmeri* (S. Watson) Fishbein & W. D. Stevens, and *S. palmeri* var. *peninsularis* (S. F. Blake) Fishbein & W. D. Stevens are provided. The nomenclatural and taxonomic validity of *Seutera* are discussed. *Ceropegia palustris* Pursh and *Amphistelma salinarum* C. Wright are placed in the synonymy of *Seutera angustifolia*. *Cynanchum mulegense* Wiggins is placed in the synonymy of *Seutera palmeri*.

Key words: Apocynaceae, Asclepiadoideae, *Cynanchum*, *Funastrum*, *Seutera*.

Woodson (1941) proposed broad generic concepts for North American Asclepiadaceae, following which *Cynanchum* L. had 23 synonyms and was divided into six subgenera. A few of the submerged genera, particularly the entirely South American *Ditassa* R. Brown and the largely South American *Tassadia* Decaisne, were rarely accepted as synonyms by subsequent students, while others, including *Metalepis* Grisebach, *Metastelma* R. Brown, and *Orthosia* Decaisne have been gradually resurrected (e.g., Stevens et al., 2001). Liede (1997) recircumscribed the New World *Cynanchum* and divided it into seven sections. More recent molecular phylogenetic results (Liede & Täuber, 2002; Liede & Meve, 2002; Rapini et al., 2003; Liede-Schumann et al., 2005) suggest that the relationships of New World *Cynanchum* and allied genera are more ambiguous than previously recognized. One of the clear messages resulting from this recent work is that only a small part of Woodson's concept of New World *Cynanchum* is likely to be retained within the evolving concept of the genus, probably only *Cynanchum* subgen. *Mellichampia* Woodson, which corresponds to Sundell's (1981) *Cynanchum* sect. *Roulinia* (Decaisne) Sundell and section *Mellichampia* (A. Gray) Sundell, and to Liede's (1997) *Cynanchum* sect. *Mellichampia*, section *Roulinia*, and section *Telminostelma* (E. Fournier) Liede. As *Cynanchum*, sensu Woodson, is gradually dismantled, the taxonomic and nomenclatural issues of the residual elements are being resolved. *Ditassa*, *Metastelma*, *Orthosia*, *Metalepis*, and *Tassadia* are now generally recognized, although sometimes ambiguously defined (Stevens, 1988, 2002; Fishbein & Levin, 1997; Rapini, 2002; Rapini et al., 2003).

Liede (1997) placed seven North American and Caribbean species in *Cynanchum* sect. *Macbridea* (Rafinesque) Liede, with the type *C. angustifolium* Persoon. While *Cynanchum angustifolium* was not specifically mentioned in Woodson's (1941) circumscription, it would key to his *Cynanchum* subgen. *Metastelma* on the basis of the umbelliform inflorescence. Liede and Meve (1997) excluded this species from *Metastelma*, noting most importantly the basally connate corona lobes. In the analysis of Liede and Täuber (2002), the three sampled species included in *Cynanchum* sect. *Macbridea*, *C. angustifolium*, *C. peninsulare* S. F. Blake, and *C. utahense* (Engelmann) Woodson are nested within *Funastrum* E. Fournier; Liede and Meve (2002) formally transferred those three species to *Funastrum*, reduced two other names originally included in *Cynanchum* sect. *Macbridea* to the synonymy of *F. peninsulare*, and left the placement of the two remaining species pending the availability of "analyzable material" (Liede & Meve, 2002: 579). This placement was reconfirmed in a broader analysis

with more limited sampling (one species) of section *Macbridea* (Liede-Schumann et al., 2005). However, support for the placement of the three species within *Funastrum*, rather than as a sister group, was not strong and was based solely on sequence data from a single chloroplast locus.

Funastrum as here circumscribed is a New World genus of about 17 species of woody vines with a corona comprised of a fleshy, unlobed ring at the junction of the corolla and the gynostegium and five vesicular lobes adnate to the backs of the anthers. The distinctive corona of *Funastrum* is a potential synapomorphy setting the genus apart from relatives in the Americas.

In our analysis of the morphology of the three species transferred to *Funastrum*, *Cynanchum utahense* is a plausible *Funastrum*; although the fleshy ring is poorly developed and the vesicles are entirely absent, the position of the ring, general shape of the anthers, and the biogeography is compatible with *Funastrum* and we accept that transfer. The other two species, however, are either thin, herbaceous, and rhizomatous (*Seutera angustifolia* (Persoon) Fishbein & W. D. Stevens) or suffrutescent and prominently corky at the base (*S. palmeri* (S. Watson) Fishbein & W. D. Stevens), somewhat succulent, glabrous, linear-leaved, twining vines growing on or near beaches or in near-shore swamps in North America and the Caribbean. The corollas are small, pale green or tinted with brown or yellow, entirely glabrous, have a short tube and long, narrow lobes that are erect at the base and then spreading, and have strongly contorted aestivation. The coronas entirely lack the fleshy ring and vesicles, but rather have five basally connate, more or less laminar, three-toothed lobes borne at the junction of the corolla and the gynostegium. Most of these characters would be discordant in *Funastrum*. It is especially difficult to conceive how such fundamentally different coronas could have arisen within a genus of seemingly recently diverged (pers. obs.) species. While the molecular sampling remains limited and the cladistic support not convincing, it seems imprudent to adopt a classification that is morphologically untenable. Rather than pretend that traditional morphology, especially of the corona, has no value whatsoever, we reject the inclusion of *Cynanchum angustifolium* and *C. peninsulare* into *Funastrum*. Instead, we propose to recognize these two morphologically distinct species in their own genus. Although one of the species, *Seutera angustifolia*, is distributed around the Gulf of Mexico, and the other, *S. palmeri*, is found in Baja California, both are primarily beach and salt marsh plants and the gap in the distribution is reasonable.

The oldest generic name for these species is *Lyonia* Elliott (Sketch Bot. S. Carolina 1: 316. 1817, nom. rej.), not *Lyonia* Rafinesque (published in 1808), nor *Lyonia* Nuttall (published in 1818, nom. cons.). *Lyonia* Elliott was renamed *Macbridea* Rafinesque (Amer. Monthly Mag. & Crit. Rev. 3: 99. June 1818) and *Seutera* Reichenbach (published in 1828), but the former has ambiguous priority relative to *Macbridea* Elliott ex Nuttall (published in late May–early June 1818, dates *fide Index Nominum Genericorum*). Since *Macbridea* Elliott ex Nuttall (Lamiaceae) is a currently recognized genus, it seems best to use the unambiguous *Seutera* for this genus.

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Amphistelma salinarum C. Wright, in Grisebach, Cat. Pl. Cub. 175. 1866. Syn. nov. *Metastelma salinarum* (C. Wright) C. Wright, in Sauvalle, Anales Acad. Ci. Med. Habana 7: 105. 1870. *Cynanchum salinarum* (C. Wright) Alain, Mem. Soc. Cub. Hist. Nat. "Felipe Poey" 22: 120. 1955. TYPE: Cuba. "Cuba occ., in pratis salinas pr. Guanimar," *C. Wright 2958* (holotype, GH not seen; isotype, MO).

This species has often been named *Cynanchum palustre* (e.g., Standley & Williams, 1969) and it is clear from both habitat and morphology that the concepts are identical. *Cynanchum salinarum* is likewise identical.

Seutera palmeri (S. Watson) Fishbein & W. D. Stevens, comb. nov. Basionym: *Pattalias palmeri* S. Watson, Proc. Amer. Acad. Arts 24: 60. 1889. *Cynanchum palmeri* (S. Watson) S. F. Blake, Contr. Gray Herb. 52: 83. 1917. TYPE: Mexico. "Near a sandy beach at Muleje," *E. Palmer 424* (holotype, GH not seen).

Cynanchum mulegense Wiggins, Proc. Calif. Acad. Sci., ser. 4, 30: 247. 1965. Syn. nov. TYPE: Mexico. Baja California Sur: mouth of Estero Mulegé, *I. Wiggins & V. Wiggins 18085*, 21 Oct. 1962 (holotype, DS not seen).

Seutera palmeri var. **peninsularis** (S. F. Blake) Fishbein & W. D. Stevens, comb. nov. Basionym: *Cynanchum peninsulare* S. F. Blake, Contr. Gray Herb. 52: 83. 1917. *Cynanchum palmeri* var. *peninsulare* (S. F. Blake) I. M. Johnston, Proc. Calif. Acad. Sci., ser. 4, 12: 1129. 1924. *Funastrum peninsulare* (S. F. Blake) Liede & Meve, Nordic J. Bot. 22: 589. 2002 [2003]. TYPE: Mexico. "Lower California, west coast of Cape Region," Nov. 1902, *T. S. Brandegee s.n.* (holotype GH, not seen).

Although *Cynanchum peninsulare* and *C. palmeri* were recognized as distinct species by Liede (1997), they were combined under *Funastrum peninsulare* by Liede and Meve (2002). We have observed several populations in the field in Baja California Sur, Mexico, and conclude that the northern, Gulf of California (*Seutera palmeri* var. *peninsularis*), and southern, Pacific Ocean (*S. palmeri* var. *palmeri*), populations differ only slightly, primarily in flower size, and we follow Johnston (1924) in treating these allopatric populations as two varieties of a single species. *Cynanchum mulegense* was described from the type locality of *Seutera palmeri* and is identical.

Acknowledgments. We thank Bruce Hansen and Victoria Hollowell for providing review comments.

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New Infragenera in *Baccharis* (Asteraceae, Astereae)

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Abstract. Five new sections of *Baccharis* (Asteraceae, Astereae) are described: *B.* sect. *Agglomeratae*, including 2 species: *B. condensata* Rusby and *B. platypoda* DC.; *B.* sect. *Canescentes*, 8 species: *B. gibertii* Baker, *B. gnaphalioides* Sprengel, *B. helichrysoides* DC., *B. leucocephala* Dusén, *B. leucopappa* DC., *B. patens* Baker, *B. phylicifolia* DC., and *B. psammophila* Malme; *B.* sect. *Curitybenses*, 1 species: *B. curitybensis* Heering ex Malme; *B.* sect. *Paleatae*, 1 species: *B. retamoides* Philippi; and *B.* sect. *Tridentatae*, 6 species: *B. deltoidea* Baker, *B. illinita* DC., *B. illinitoides* Malagarriga, *B. isabelae* Soria & Zardini, *B. subopposita* DC., and *B. tridentata* Vahl. Four new series of *Baccharis* are described: *B.* [sect. *Angustifoliae*] ser. *Uniflorae*, 7 species: *B. frigida* Kunth, *B. hutchisonii* Cuatrecasas, *B. laxiflora* Rusby, *B. libertadensis* (S. B. Jones) H. Robinson, *B. sternbergiana* Steudel, *B. trineura* Soria & Zardini, and *B. uniflora* (Ruiz & Pavón) Persoon; *B.* [sect. *Cylindricae*] ser. *Axillares*, 20 species: *B. angusticeps* Dusén ex Malme, *B. aracatubensis* Malagarriga & Hatschbach, *B. axillaris* DC., *B. concinna* G. M. Barroso, *B. cultrata* Baker, *B. elliptica* Gardner, *B. hypericifolia* Baker, *B. incisa* Hooker & Arnott, *B. lateralis* Baker, *B. lymanii* G. M. Barroso, *B. minutiflora* Martius ex Baker, *B. parvidentata* Malagarriga, *B. paucifloscula* DC., *B. perdusenii* Giuliano, *B. polyphylla* Gardner, *B. pseudovaccinioides* Malagarriga, *B. selloi* Baker, *B. serrula* Schultz Bipontinus ex Baker, *B. truncata* Gardner, and *B. xiphophylla* Baker; *B.* [sect. *Nitidae*] ser. *Hirsutae*, 1 species: *B. muelleri* Baker; and *B.* [sect. *Nitidae*] ser. *Lanuginosae*, 4 species: *B. calvescens* DC., *B. elaeagnoides* Steudel ex Baker, *B. myricifolia* DC., and *B. semiserrata* DC. Three new combinations at the series level are proposed: *Baccharis* ser. *Angustifoliae* (Baker) Giuliano; *B.* ser. *Cylindricae* (Heering) Giuliano; and *B.* ser. *Nitidae* (Cuatrecasas) Giuliano. A new name, *Baccharis perdusenii*, is proposed to replace the illegitimate name *B. dusenii* G. M. Barroso. A respective lectotype is designated for *B. platypoda*, *B. retamoides*, and *B. tridentata*; a neotype is designated for *B. uniflora*.

Resumen. Se describen cinco nuevas secciones de *Baccharis* (Asteraceae, Astereae): *B.* sect. *Agglomeratae*, incluyendo 2 especies: *B. condensata* Rusby y *B. platypoda* DC.; *B.* sect. *Canescentes*, 8 especies: *B. gibertii* Baker, *B. gnaphalioides* Sprengel, *B. helichrysoides* DC., *B. leucocephala* Dusén, *B. leucopappa* DC., *B. patens* Baker, *B. phylicifolia* DC. y *B. psammophila* Malme; *B.* sect. *Curitybenses*, 1 especie: *B. curitybensis* Heering ex Malme; *B.* sect. *Paleatae*, 1 especie: *B. retamoides* Philippi; y *B.* sect. *Tridentatae*, 6 especies: *B. deltoidea* Baker, *B. illinita* DC., *B. illinitoides* Malagarriga, *B. isabelae* Soria & Zardini, *B. subopposita* DC. y *B. tridentata* Vahl. Se describen cuatro nuevas series de *Baccharis*: *B.* [sect. *Angustifoliae*] ser. *Uniflorae*, 7 especies: *B. frigida* Kunth, *B. hutchisonii* Cuatrecasas, *B. laxiflora* Rusby, *B. libertadensis* (S. B. Jones) H. Robinson, *B. sternbergiana* Steudel, *B. trineura* Soria & Zardini y *B. uniflora* (Ruiz & Pavón) Persoon; *B.* [sect. *Cylindricae*] ser. *Axillares*, 20 especies: *B. angusticeps* Dusén ex Malme, *B. aracatubensis* Malagarriga & Hatschbach, *B. axillaris* DC., *B. concinna* G. M. Barroso, *B. cultrata* Baker, *B. elliptica* Gardner, *B. hypericifolia* Baker, *B. incisa* Hooker & Arnott, *B. lateralis* Baker, *B. lymanii* G. M. Barroso, *B. minutiflora* Martius ex Baker, *B. parvidentata* Malagarriga, *B. pauciflosculosa* DC., *B. perdusenii* Giuliano, *B. polyphylla* Gardner, *B. pseudovaccinioides* Malagarriga, *B. selloi* Baker, *B. serrula* Schultz Bipontinus ex Baker, *B. truncata* Gardner y *B. xiphophylla* Baker; *B.* [sect. *Nitidae*] ser. *Hirsutae*, 1 especie: *B. muelleri* Baker; y *B.* [sect. *Nitidae*] ser. *Lanuginosae*, 4 especies: *B. calvescens* DC., *B. elaeagnoides* Steudel ex Baker, *B. myricifolia* DC. y *B. semiserrata* DC. Se proponen tres nuevas combinaciones a nivel de series: *Baccharis* ser. *Angustifoliae* (Baker) Giuliano, *B.* ser. *Cylindricae* (Heering) Giuliano y *B.* ser. *Nitidae* (Cuatrecasas) Giuliano. Se propone un nombre nuevo, *Baccharis perdusenii*, para reemplazar el nombre ilegítimo *B. dusenii* G. M. Barroso. Se designa un respectivo lectotipo para *B. platypoda*, *B. retamoides* y *B. tridentata*; se designa un neotipo para *B. uniflora*.

Key words: Asteraceae, Astereae, *Baccharis*, sections, series, South America.

Baccharis L., with ca. 375 species (Giuliano, in prep.), is the largest genus within Asteraceae tribe Astereae. Its infrageneric taxonomy is under revision; the sections created by classical authors (Persoon, 1807; Candolle, 1836; Baker, 1882) were highly heterogeneous groups, since they were based upon vegetative features (mainly leaf shape). Cuatrecasas (1967) redefined and lectotypified those infragenera, thus elucidating in part this problem. However, nearly 90 species have never been assigned to sections, whereas many others are misplaced in the sections into which they were originally classified. Here nomenclatural novelties are presented, in advance of the overall revision of the infrageneric taxonomy of *Baccharis*.

New Sections of *Baccharis*

Baccharis sect. **Agglomeratae** Giuliano, sect. nov. TYPE: *Baccharis platypoda* DC., Prodr. 5: 409. 1836.

A ceteris sectionibus generis *Baccharidis* differt foliis penninervis numerosis nervis lateralibus et capitulescentiis valde dimorphis (capitula staminata in glomerulis longiter pedunculatis ad axilam foliorum superiorum inserta; capitula pistillata in capitulescentiis globosis densis terminalibus disposita).

Erect shrubs, clothed by minute tufted trichomes. Leaves petiolate, blade pinnately veined, margins entire or with few pairs of teeth. Capitula sessile, the staminate ones arranged in long pedicellate glomerules inserted at the axils of the distal leaves, the carpellate ones arranged in terminal sessile globose capitulescences; involucres campanulate; receptacles flat, alveolate. Ratio of carpellate:staminate florets [corresponding to carpellate vs. staminate specimens respectively] ca. 1:1. Carpellate florets with corollas dentate at apex. Achenes terete, 10-ribbed, glabrous; pappus bristles in 2 series, non-accrescent, caducous. Staminate florets with corollas showing little differentiated limb; style branches attached, brief; pappus bristles plumose at apex.

Includes two species, one from the Andes of Bolivia (*B. condensata*) and the other from eastern Brazil (*B. platypoda*).

1. **Baccharis condensata** Rusby, Descr. S. Amer. Pl.: 148. 1920.
2. **Baccharis platypoda** DC., Prodr. 5: 409. 1836. TYPE: "N° 283, Herbier de Brésil (Mr. Vauthier 1833), Marianne (Prov. Minas Geraes), Boite N° 795 Herb. genevense" (lectotype, designated here, G-DC). [This specimen was selected from the three sheets at G-DC containing type material because it is representative for the species, and the label clearly provides the type locality and collection data.]

Baccharis platypoda was placed by Candolle (1836) and Baker (1882) in the formerly heterogeneous broad section *Cuneifoliae* DC. in *Baccharis*. The other species included in section *Agglomeratae* has never been classified into any section.

Section *Agglomeratae* belongs to subgenus *Baccharis* because it has attached brief staminate style branches and 10-ribbed glabrous achenes with biseriate caducous pappus bristles; however, its affinities with other sections are unknown. This section is unique within the genus because of the capitulescence dimorphism and the pinnately veined blades with numerous lateral veins.

Baccharis sect. **Canescentes** Giuliano, sect. nov. TYPE: *Baccharis helichrysoides* DC., Prodr. 5: 415. 1836.

Suffrutices albo-lanuginosi; folia sessilia discoloria uninervia vel penninervia; capitula in cymis corymbiformibus compositis axillaribus et terminalibus vel in cymis corymbiformibus congestis ad apicem ramulorum disposita; involucra hemisphaerica; achaenia 5-costata pilis geminis et papillis vestita; florum pistillatorum setae pappi accrescentes; florum staminatorum rami styli lanceolati separati.

Erect or decumbent subshrubs, plants lanuginous, densely clothed by uniseriate straight or slightly curved trichomes, usually accompanied by biseriate glandular trichomes on upper leaf surfaces and by tangled uniseriate trichomes on lower leaf surfaces. Leaves sessile, discolorous, 1-veined or with 1 to 3 pairs of lateral veins, margins entire and revolute. Capitula pedicellate, arranged in axillary and terminal compound corymbiform cymes, or in congested corymbiform cymes at the apex of scapose stems; involucres hemispheric; receptacles convex or conic, alveolate, clothed by trichomes. Ratio of carpellate:staminate florets ca. 1:1. Carpellate florets with corollas dentate at apex. Achenes terete, 5-ribbed, with short and asymmetric or very long twin trichomes; pappus bristles in 2 series, accrescent, persistent. Staminate florets with corollas showing well-differentiated limb; style branches lanceolate, free; pappus bristles smooth.

Eight species, which grow in eastern and southern Brazil, southeastern Paraguay, northeastern Argentina, and Uruguay.

1. **Baccharis gibertii** Baker, in Martius, Fl. Bras. 6(3): 52. 1882.
2. **Baccharis gnaphalioides** Sprengel, Syst. Veg. 3: 461. 1826.
3. **Baccharis helichrysoides** DC., Prodr. 5: 415. 1836. TYPE: Brazil. Rio Grande do Sul: *Sello d2013* (ex Herbarium of Museum Imperialis Brasiliensis n° 811) (lectotype, designated by Barroso (1976: 60), P).

4. **Baccharis leucocephala** Dusén, Ark. Bot. 9(15): 24. 1910.
5. **Baccharis leucopappa** DC., Prodr. 5: 415. 1836.
6. **Baccharis patens** Baker, in Martius, Fl. Bras. 6(3): 52. 1882.
7. **Baccharis phylicifolia** DC., Prodr. 5: 415. 1836.
8. **Baccharis psammophila** Malme, Kongl. Svenska Vetenskapsakad. Handl. ser. 3, 12(2): 70. 1933.

Baccharis leucocephala and *B. psammophila* have not been assigned to any section before; the other species have been placed by classical authors (Candolle, 1836; Hooker & Arnott, 1841; Baker, 1882) in the formerly heterogeneous section *Discolores* DC.; however, by virtue of the redefinition of this section by Cuatrecasas (1967), it has to include *B. phylicoides* Kunth and related species (*B. caprariifolia* DC., *B. erioclada* DC., *B. nummuloides* Heering ex Malme, etc.). Also, several of the species here affiliated with section *Canescentes* were placed by Heering (1904) and Giuliano (2001) in *Baccharis* sect. *Paniculatae* Heering, but the latter possesses heads solitary at the apex of short branchlets (in turn grouped to form leafy paniculate capitulescences), usually flat naked receptacles, and achenes with uniseriate non-glandular trichomes and/or biseriate glandular trichomes, while section *Canescentes* has heads inserted at the axils of highly reduced bracts, conic or convex receptacles covered by long setae, and achenes with twin trichomes.

Baccharis sect. **Curitybenses** Giuliano, sect. nov. TYPE: *Baccharis curitybensis* Heering ex Malme, Kongl. Svenska Vetenskapsakad. Handl. ser. 3, 12(2): 69. 1933.

Sectionibus subgeneris *Baccharidis* similis achaeniis 10-costatis et pappi setis 2-seriatis caducis, sed florum staminatorum styli ramis lanceolatis separatis et achaeniis pilis geminis vestitis differt.

Erect shrubs, lanuginous, densely clothed by uniseriate filiform trichomes. Leaves petiolate, blades discolorous, 3-veined, margins entire or with few pairs of teeth. Capitula pedicellate, arranged in corymbiform cymes inserted at the axil of reduced distal leaves, in all forming a leafy compound corymb; involucres hemispheric; receptacles flat, alveolate. Ratio of carpellate:staminate florets ca. 1:1. Carpellate florets with corollas dentate at apex. Achenes terete, 10-ribbed, with twin trichomes; pappus bristles in 2 series, non-accrescent, caducous. Staminate florets with corollas with well-differentiated limb; style branches lanceolate, free; pappus bristles plumose at apex.

Includes only one species, endemic to southeastern Brazil (São Paulo, Paraná, and Santa Catarina).

1. **Baccharis curitybensis** Heering ex Malme, Kongl. Svenska Vetenskapsakad. Handl. ser. 3, 12(2): 69. 1933. TYPE: Brazil. Paraná: Curitiba, 20 Oct. 1908, *Dusén 6906* (lectotype, designated by Barroso (1976: 97), S).

This species was not previously affiliated with any section. It shows contradictory characters: the number and structure of the achene ribs and the number of series and the caducous condition of the pappus bristles are similar to those of subgenus *Baccharis*; on the other hand, the style branches are lanceolate and free as in all the rest of the subgenera, and the achenes are clothed by twin trichomes. Further research is needed in order to elucidate its affinities.

Baccharis sect. **Paleatae** Giuliano, sect. nov. TYPE: *Baccharis retamoides* Philippi, Anales Univ. Chile 34: 180. 1870.

Sectioni *Angustifoliis* primo adspectu similis, sed plantis minutis nidis pilosis vestitis, capitulorum pistillatorum receptaculis paleaceis, floribus pistillatis:staminatis ratione 4:1 vel 5:1, et achaeniis pilis geminis dense vestitis differt.

Erect subshrubs, clothed by minute tufted trichomes. Leaves sessile, blades 1-veined, margins entire, the distal ones reduced to small bracts. Capitula pedicellate, solitary at the apex of the branches or grouped to form a corymbiform or racemiform cyme; involucres hemispherical; receptacles of carpellate capitula paleaceous. Ratio of carpellate:staminate florets 4:1 or 5:1. Carpellate florets with corollas truncate at apex. Achenes terete, 5-ribbed, large-sized (2.7–4.5 mm long), densely clothed by long twin trichomes; pappus bristles in 2 to 3 series, accrescent, persistent. Staminate florets with corollas showing well-differentiated limb; style branches lanceolate, free; pappus bristles denticulate.

Includes a single species, which grows in Argentina, from the provinces of Salta to Mendoza.

1. **Baccharis retamoides** Philippi, Anales Univ. Chile 34: 180. 1870. TYPE: Argentina. Mendoza: 1868–1869, *R. Philippi s.n.* (lectotype, designated here, SGO-060829). [Although the two original type material sheets (the other is SGO-044062) are morphologically similar and present identical collection data, this specimen is selected because it is more profusely branched.]

This species was previously placed within section *Angustifoliae* Baker emend. Cuatrecasas (Giuliano, 2001), based on leaf morphology and capitulescence architecture; nevertheless, it presents remarkable differences, such as the vegetative vestiture of minute tufted hairs (vs. non-tufted uniseriate hairs with acuminate apical cell), carpellate capitula with paleaceous receptacles (vs. non-paleaceous), ratio of carpellate:staminate florets ca. 5:1 (vs. ca. 1:1), and achenes clothed by long twin trichomes (vs. sparsely clothed by uniseriate trichomes). Within *Baccharis*, the paleaceous receptacles are found in section *Oblongifoliae* DC. emend. Cuatrecasas, *Pseudobaccharis* (Cabrera) Cuatrecasas, *Psila* (Philippi) Cuatrecasas, and *Trinervatae* DC. emend. Cuatrecasas, whereas hemispherical involucres plus ratio of florets 5:1 are present in section *Stephananthus* (Lehmann) Heering; nevertheless, *B. retamoides* shows notable differences (especially in habit, and achene and pappus morphology), which makes highly improbable any relationship among any of them.

Baccharis sect. **Tridentatae** Giuliano, sect. nov. TYPE: *Baccharis tridentata* Vahl., Symb. Bot. 3: 98. 1794.

Sectioni *Cylindricis* affinis plantis xylopodiferis et foliis trinervatis saepe oppositis vel subopppositis, sed capitulis in cymis corymbiformibus compositis dispositis, capitulorum pistillatorum involucris campanulatis pedicellatis, floribus pistillatis: staminatis ratione 2:1, et florum pistillatorum setae pappi non accrescentes differt.

Erect subshrubs with xylopodium, clothed by minute tufted trichomes. Leaves pseudopetiolate, 3-veined, margins with few pairs of teeth. Capitula pedicellate, arranged in compound corymbiform cymes at the apex of the branches; involucres campanulate; receptacles of the carpellate capitula flat, of the staminate ones convex, both alveolate. Ratio of carpellate:staminate florets ca. 2:1. Carpellate florets with corollas dentate at apex. Achenes terete, 10-ribbed, glabrous; pappus bristles in 2 series, non-accrescent, caducous. Staminate florets with corollas showing little differentiated limb; style branches attached, brief; pappus bristles plumose at apex.

Six species, which grow in two areas: Andes of Bolivia and northwestern Argentina, and from eastern Brazil to northeastern and central Argentina.

1. **Baccharis deltoidea** Baker, in Martius, Fl. Bras. 6(3): 90. 1882.
2. **Baccharis illinita** DC., Prodr. 5: 412. 1836.
3. **Baccharis illinitoides** Malagarriga, Mem. Soc. Ci. Nat. La Salle 37: 138. 1976.
4. **Baccharis isabelae** Soria & Zardini, Candollea 46(2): 537. 1991.
5. **Baccharis subopposita** DC., Prodr. 5: 413. 1836.
6. **Baccharis tridentata** Vahl, Symb. Bot. 3: 98. 1794. TYPE: "*Baccharis tridentata*; *Conyza cuneifolia*; Montevideo," *Commerson s.n.* (lectotype, designated here, C). [This is the single original specimen of this taxon deposited at C; Vahl in the protologue solely stated "habitat in Brasilia."]

Baccharis illinitoides and *B. isabelae* have not been assigned at the sectional level before; the other four species were formerly placed in the large heterogeneous section *Cuneifoliae* DC. by classical authors (Candolle, 1836; Hooker & Arnott, 1841; Baker, 1882). Recently, *B. subopposita* and *B. tridentata* were placed by Giuliano (2001) in section *Cylindricae* Heering because they present xylopodium as well as 3-veined opposite or subopposite leaves, but they do have significant differences such as: capitula in compound corymbs (vs. foliose spikes or glomerules), carpellate capitula with involucres campanulate (vs. cylindrical), the ratio of carpellate:staminate florets 2:1 (vs. 1:1), and a pappus slightly accrescent (vs. usually notably accrescent); these differences justify the recognition of this taxon as an independent section.

NEW SERIES OF *BACCHARIS*

Baccharis sect. **Angustifoliae** Baker emend. Cuatrecasas

Baccharis ser. **Uniflorae** Giuliano, ser. nov. TYPE: *Molina uniflora* Ruiz & Pavón, Syst. Veg. 208. 1798 [≡ *Baccharis uniflora* (Ruiz & Pavón) Persoon].

A serie typica differt plantis minutis nidis pilosis vestitis et foliis trinervis.

Plants clothed by minute tufted trichomes. Leaves 3-veined. Receptacles of carpellate capitula without paleae. Ratio of carpellate:staminate florets ca. 1:1.

Seven species, mainly distributed in the Andean region of Ecuador, Peru, and Bolivia.

1. **Baccharis frigida** Kunth, in Humboldt, Bonpland & Kunth, Nov. Gen. Sp. 4 [folio]: 38. 1818.
2. **Baccharis hutchisonii** Cuatrecasas, Caldasia 10: 25. 1967.
3. **Baccharis laxiflora** Rusby, Bull. New York Bot. Gard. 8(28): 129. 1912.
4. **Baccharis libertadensis** (S. B. Jones) H. Robinson, Phytologia 65(1): 37. 1988.

5. **Baccharis sternbergiana** Steudel, Nomencl. Bot. (ed. 2) 1: 179. 1840. Replaced name: *Baccharis semiserrata* DC., Prodr. 5: 419, n° 149. 1836, non *Baccharis semiserrata* DC., Prodr. 5: 404, n° 38. 1836.
6. **Baccharis trineura** Soria & Zardini, Candollea 56: 116. 2001.
7. **Baccharis uniflora** (Ruiz & Pavón) Persoon, Syn. Pl. 2: 425. 1807. *Molina uniflora* Ruiz & Pavón, Syst. Veg.: 208. 1798. TYPE: Peru. Junín: Tarma, 13,000 ft., June 1922, *Macbride & Featherstone 1051* (neotype, designated here, US). [The original type material of Ruiz and Pavón could not be located at MA or any other herbaria where duplicates of their specimens are deposited; therefore, a neotype must be designated. The specimen *Macbride & Featherstone 1051* was selected because it is representative for the species and was collected in one of the original type localities.]

For the following series that includes the lectotypified species for *Baccharis* sect. *Angustifoliae*, *Baccharis ulicina* Hooker & Arnott, the following combination is proposed:

Baccharis ser. **Angustifoliae** (Baker) Giuliano, stat. nov. Basionym: *Baccharis* sect. *Angustifoliae* Baker, in Martius, Fl. Bras. 6(3): 55. 1882; emend. Cuatrecasas, Revista Acad. Colomb. Ci. Exact. 13(49): 88. 1967. TYPE: *Baccharis ulicina* Hooker & Arnott, J. Bot. (Hooker) 3: 38. 1841 (lectotype, designated by Cuatrecasas (1967: 88)).

Plants loosely clothed by small uniseriate trichomes with apiculate or flagellate terminal cells. Leaves uninervate. Receptacles of carpellate capitula without paleae. Ratio of carpellate:staminate florets ca. 1:1.

Includes 19 North and South American species.

1. **Baccharis darwinii** Hooker & Arnott, J. Bot. (Hooker) 3: 39. 1841.
2. **Baccharis erosoricola** Rzedowski, Bol. Soc. Bot. México 45: 111. 1983 [1984].
3. **Baccharis gracilis** DC., Prodr. 5: 423. 1836.
4. **Baccharis heterothalmoides** Britton, Bull. Torrey Bot. Club 19: 4. 1892.
5. **Baccharis marcetiifolia** Bentham, Pl. Hartw.: 202. 1845.
6. **Baccharis melanopotamica** Spegazzini, Anales Soc. Ci. Argent. 48: 189. 1899.
7. **Baccharis multisulcata** Baker, in Martius, Fl. Bras. 6(3): 45. 1882.
8. **Baccharis nivalis** (Weddell) Schultz Bipontinus ex Philippi, Anales Univ. Chile 87: 705. 1894.
9. **Baccharis occidentalis** S. F. Blake, Contr. U.S. Natl. Herb. 22(8): 595. 1924.
10. **Baccharis orbignyana** Klatt, Abh. Naturf. Ges. Halle 15: 327. 1882.
11. **Baccharis palmeri** Greenman, Proc. Amer. Acad. Arts 41(9): 259. 1905.
12. **Baccharis petrophila** R. E. Fries, Nov. Acta Regiae. Soc. Sci. Upsal. ser. 4, 1(1): 81. 1905.
13. **Baccharis squarrosa** Kunth, in Humboldt, Bonpland & Kunth, Nov. Gen. Sp. 4 [folio]: 52. 1818.
14. **Baccharis taltalensis** Johnston, Contr. Gray Herb. 85: 125. 1929.
15. **Baccharis tenella** Hooker & Arnott, J. Bot. (Hooker) 3: 42. 1841.
16. **Baccharis texana** (Torrey & A. Gray) A. Gray, Mem. Amer. Acad. Arts, n.s., 4: 75. 1849.
17. **Baccharis ulicina** Hooker & Arnott, J. Bot. (Hooker) 3: 38. 1841. TYPE: Argentina. Woods of Córdoba, *Tweedie 1123* (holotype, K not seen).
18. **Baccharis vanessae** R. M. Beauchamp, Phytologia 46(4): 216. 1980.
19. **Baccharis wrightii** A. Gray, Smithsonian Contr. Knowl. 3(5): 101. 1852.

Baccharis sect. **Cylindricae** Heering

Baccharis ser. **Axillares** Giuliano, ser. nov. TYPE: *Baccharis axillaris* DC., Prodr. 5: 407. 1836.

A serie typica differt foliis saepe sessilibus trinervis vel penninervis, capitulis in spicis vel racemis foliosis dispositis, florum pistillatorum setis pappi non accrescentibus.

Leaves usually sessile, 3-veined or pinnately veined. Capitula arranged in leafy spikes or racemes. Pappus of carpellate florets non-accrescent.

Twenty species, distributed in eastern and southern Brazil.

1. **Baccharis angusticeps** Dusén ex Malme, Kongl. Svenska Vetenskapsakad. Handl. ser. 3, 12(2): 77. 1933.
2. **Baccharis aracatubensis** Malagarriga & Hatschbach, Rodriguésia 28(40): 168. 1976.
3. **Baccharis axillaris** DC., Prodr. 5: 407. 1836. TYPE: Brazil. "Sancti-Pauli," 1833, *Sello s.n.* (ex Herbarium of Museum Imperialis Brasiliensis n° 481) (holotype, P).
4. **Baccharis concinna** G. M. Barroso, Rodriguésia 28(40): 162. 1976.
5. **Baccharis cultrata** Baker, in Martius, Fl. Bras. 6(3): 93. 1882.
6. **Baccharis elliptica** Gardner, London J. Bot. 7: 83. 1848.
7. **Baccharis hypericifolia** Baker, in Martius, Fl. Bras. 6(3): 69. 1882.
8. **Baccharis incisa** Hooker & Arnott, J. Bot. (Hooker) 3: 29. 1841.

9. Baccharis lateralis Baker, in Martius, Fl. Bras. 6(3): 100. 1882.
10. Baccharis lymanii G. M. Barroso, Rodriguésia 28(40): 165. 1976.
11. Baccharis minutiflora Martius ex Baker, in Martius, Fl. Bras. 6(3): 69. 1882.
12. Baccharis parvidentata Malagarriga, Mem. Soc. Ci. Nat. La Salle 37(107): 138. 1976.
13. Baccharis pauciflosculosa DC., Prodr. 5: 413. 1836.
14. Baccharis perdusenii Giuliano, nom. nov. Replaced name: *Baccharis dusenii* G. M. Barroso, Rodriguésia 28(40): 166. 1976, nom. illeg., non *B. dusenii* O. Hoffmann, in Dusén, Wiss. Erg. Schwed. Exp. Magellansl. 3(5): 244. 1900. TYPE: Brazil. Rio de Janeiro: Itatiaia, 1902, *Dusén 660* (holotype, R not seen).
15. Baccharis polyphylla Gardner, London J. Bot. 7: 88. 1848.
16. Baccharis pseudovaccinioides Malagarriga, Contr. Inst. Geobiol. La Salle Canoas 2: 47. 1952.
17. Baccharis selloi Baker, in Martius, Fl. Bras. 6(3): 68. 1882.
18. Baccharis serrula Schultz Bipontinus ex Baker, in Martius, Fl. Bras. 6(3): 70. 1882.
19. Baccharis truncata Gardner, London J. Bot. 7: 82. 1848.
20. Baccharis xiphophylla Baker, in Martius, Fl. Bras. 6(3): 68. 1882.

For the following series that includes the lectotypified species for *Baccharis* sect. *Cylindricae*, *Baccharis santiagensis* Heering [= *B. rufescens* Sprengel], designated by Ariza Espinar (1973: 180), the following combination is proposed:

Baccharis ser. **Cylindricae** (Heering) Giuliano, stat. nov. Basionym: *Baccharis* sect. *Cylindricae* Heering, in Reiche, Anales Univ. Chile 111: 176. 1902 [1903]. TYPE: *Baccharis santiagensis* Heering, in Reiche, Anales Univ. Chile 111: 176. 1902 [1903] (lectotype, designated by Ariza Espinar (1973: 180)).

Leaves pseudopetiolate (rarely petiolate), 3-veined. Capitula arranged in leafy glomerules, which usually are arranged in a raceme-like capitulescence. Pappus of carpellate florets usually accrescent.

Includes 31 species mainly from Brazil, Paraguay, Uruguay, and Argentina; a few species have Andean distribution.

1. Baccharis brevifolia DC., Prodr. 5: 409. 1836.
2. Baccharis camporum DC., Prodr. 5: 399. 1836.
3. Baccharis chilco Kunth, in Humboldt, Bonpland & Kunth, Nov. Gen. Sp. 4 [folio]: 44. 1818.
4. Baccharis cognata DC., Prodr. 5: 413. 1836.
5. Baccharis flabellata Hooker & Arnott, J. Bot. (Hooker) 3: 28. 1841.
6. Baccharis glaucescens (Chodat & Hassler) Soria & Zardini, Candollea 46: 539. 1991.
7. Baccharis humilis Schultz Bipontinus ex Baker, in Martius, Fl. Bras. 6(3): 92. 1882.
8. Baccharis intermixta Gardner, London J. Bot. 7: 84. 1848.
9. Baccharis itatiaiae Wawra, Itin. Princ. S. Coburgi 2: 28. 1888.
10. Baccharis leptocephala DC., Prodr. 5: 413. 1836.
11. Baccharis leptophylla DC., Prodr. 5: 423. 1836.
12. Baccharis longii Govaerts, World Checklist Seed Pl. 2(1): 9. 1996.
13. Baccharis microdonta DC., Prodr. 5: 416. 1836.
14. Baccharis oreophila Malme, Kongl. Svenska Vetenskapsakad. Handl. ser. 3, 12(2): 75. 1933.
15. Baccharis pedersenii Cabrera, Darwiniana 16: 410. 1970.
16. Baccharis pentodonta Malme, Kongl. Svenska Vetenskapsakad. Handl. 32(5): 52. 1899.
17. Baccharis pentziifolia Schultz Bipontinus ex Baker, in Martius, Fl. Bras. 6(3): 96. 1882.
18. Baccharis petraea Heering, Jahrb. Hamburg. Wiss. Anst. 21 (Beih. 3): 30. 1904.
19. Baccharis pflanzii Perkins, Bot. Jahrb. Syst. 49: 224. 1913.
20. Baccharis pseudobrevifolia D. J. N. Hind, Kew Bull. 48: 263. 1993.
21. Baccharis pseudotenuifolia Malagarriga, Contr. Inst. Geobiol. La Salle Canoas 2: 46. 1952.
22. Baccharis ramosissima Gardner, London J. Bot. 7: 84. 1848.
23. Baccharis reticularia DC., Prodr. 5: 409. 1836.
24. Baccharis retusa DC., Prodr. 5: 412. 1836.
25. Baccharis rufescens Sprengel, Syst. Veg. 3: 464. 1826.

Baccharis santiagensis Heering, in Reiche, Anales Univ. Chile 111: 176. 1902 publ. 1903. TYPE: Chile. Cordilleras de Santiago, *Díaz 21* (holotype, SGO).

26. **Baccharis salzmannii** DC., Prodr. 5: 409. 1836.
27. **Baccharis schultzii** Baker, in Martius, Fl. Bras. 6(3): 78. 1882.
28. **Baccharis sessiliflora** Vahl, Symb. Bot. 3: 97. 1794.
29. **Baccharis subdentata** DC., Prodr. 5: 408. 1836.
30. **Baccharis varians** Gardner, London J. Bot. 7: 84. 1848.
31. **Baccharis vernicosa** Hooker & Arnott, J. Bot. (Hooker) 3: 28. 1841.

Baccharis sect. **Nitidae** Cuatrecasas

Baccharis ser. **Hirsutae** Giuliano, ser. nov. TYPE: *Baccharis muelleri* Baker, in Martius, Fl. Bras. 6(3): 61. 1882.

A serie typica differt pilis hirsutis et capitulis in cymis corymbiformibus terminalibus dispositis.

Plants hirsute, clothed by long erect uniseriate trichomes and minute glandular and non-glandular tufted trichomes; the vestiture becomes much sparser with age. Capitula in terminal corymbiform cymes.

Includes a single species, endemic to the state of Santa Catarina, Brazil.

1. **Baccharis muelleri** Baker, in Martius, Fl. Bras. 6(3): 61. 1882. TYPE: Brazil. Santa Catarina: Barra do Itajaí, *Mueller 355* (lectotype, designated by Barroso (1976: 99), K).

Baccharis ser. **Lanuginosae** Giuliano, ser. nov. TYPE: *Baccharis calvescens* DC., Prodr. 5: 413. 1836.

A serie typica differt plantis albo-lanuginosis pilis uniseriatis rectis et crispis dense vestitis.

Plants lanuginous, clothed by long uniseriate trichomes accompanied by minute glandular and non-glandular tufted trichomes on upper leaf surfaces, and by tufts of short crisped trichomes on lower leaf surfaces; the pubescence becomes much sparser with age. Leaves concolorous or discolorous. Capitula arranged in axillary corymbiform cymes.

Four species, distributed in eastern and southern Brazil, eastern Paraguay, and the province of Misiones, Argentina.

1. **Baccharis calvescens** DC., Prodr. 5: 413. 1836. TYPE: Brazil. Minas Gerais: Marianna, *Vauthier 332* (lectotype, designated by Barroso (1976: 119), G-DC).
2. **Baccharis elaeagnoides** Steudel ex Baker, in Martius, Fl. Bras. 6(3): 53. 1882.
3. **Baccharis myricifolia** DC., Prodr. 5: 405. 1836.
4. **Baccharis semiserrata** DC., Prodr. 5: 404. 1836.

Baccharis semiserrata presents vestiture sparser than that of *B. calvescens* and *B. elaeagnoides*, whereas in *B. myricifolia* the pubescence is only restricted to young organs.

For the following series that includes the lectotypified species for *Baccharis* sect. *Nitidae*, *Molina nitida* Ruiz & Pavón, the following combination is proposed:

Baccharis ser. **Nitidae** (Cuatrecasas) Giuliano, stat. nov. Basionym: *Baccharis* sect. *Nitidae* Cuatrecasas, Revista Acad. Colomb. Ci. Exact. 13(49): 70. 1967. TYPE: *Molina nitida* Ruiz & Pavón, Syst. Veg.: 204. 1798 [≡ *Baccharis nitida* (Ruiz & Pavón) Persoon].

Plants clothed by minute tufted trichomes. Leaves concolorous. Capitula usually arranged in axillary corymbs.

Includes six species from the Andes, the Guayana Shield, Brazil, and Paraguay.

1. **Baccharis amambayensis** Zardini & Soria, Candollea 46: 535. 1991.
2. **Baccharis dentata** (Vellozo) G. M. Barroso, Rodriguésia 28(40): 123. 1976.
3. **Baccharis nitida** (Ruiz & Pavón) Persoon, Syn. Pl. 2: 425. 1807. *Molina nitida* Ruiz & Pavón, Syst. Veg.: 204. 1798. TYPE: Peru. "Lima. Clasis 19. *Baccharis axillaris*. F. P. c. 1.65.c.d. ex Chinchao" (lectotype, designated by Cabrera (1960: 199), MA).
4. **Baccharis rivularis** Gardner, London J. Bot. 7: 83. 1848.
5. **Baccharis schomburgkii** Baker, Fl. Bras. 6(3): 89. 1882.
6. **Baccharis singularis** (Vellozo) G. M. Barroso, Rodriguésia 28(40): 96. 1976.

Acknowledgments. I thank Susana Freire for helpful comments, and John Pruski and John Temple for valuable reviews of the manuscript. This study was supported by a fellowship ("Beca de Formación de Postgrado") awarded by the Consejo Nacional de Investigaciones Científicas y Técnicas de la República Argentina (CONICET).

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Taxonomic Novelties in *Astragalus* (Leguminosae) for South America

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Abstract. A new species in *Astragalus*, endemic for Peru, is described for Leguminosae, Galegeae. *Astragalus sagasteguii* may be compared with the related *A. dillinghami* Macbride in Peru and *A. diminutivus* (Philippi) Gómez-Sosa in Bolivia and Argentina. The new combination *Astragalus diminutivus* is made, transferring the species from the genus *Phaca*. In addition, *Astragalus deminutivus* I. M. Johnston newly synonymizes to *A. diminutivus*. Further, *Astragalus dielsii* Macbride is recognized as a variety to *A. diminutivus*. The geographical distribution of *Astragalus diminutivus* var. *dielsii* extends from Peru into Bolivia and Argentina. Morphological description and comparison, illustration, as well as habitat and geographical distribution are provided.

Resumen. Una nueva especie de *Astragalus*, endémica del Perú, es descripta para Leguminosae, Galegeae. *Astragalus sagasteguii*, puede ser comparada con *A. dillinghami* Macbride, en Perú, y *A. diminutivus* (Philippi) Gómez-Sosa en Bolivia y Argentina. Además *A. dielsii* Macbride es transferida como una variedad de *A. diminutivus*. La distribución geográfica de *Astragalus diminutivus* var. *dielsii* se extiende desde Perú a Bolivia y Argentina. Se incluyen descripciones, tabla de relaciones, ilustraciones, datos sobre hábitat y distribución geográfica.

Key words: Argentina, *Astragalus*, Bolivia, Chile, Galegeae, Leguminosae, Peru.

The genus *Astragalus* L. includes ca. 2500 species (Podlech, 1986) with a worldwide distribution, except for Australia and New Zealand. There are about 110 species endemic to South America; they are found in Ecuador, Peru, Bolivia, Chile, Argentina, and Uruguay (Gómez-Sosa, 1979; Daviña & Gómez-Sosa, 1993). There is only one species of the genus, *A. distinens* Macloskie, known from Uruguay (Gómez-Sosa, 2003).

There is a group of South American *Astragalus* species of tiny, matted or tufted herbs. In many instances, these taxa have unknown fruit or have been incompletely collected; consequently, it is dificult to delimit species. Inside this group are the taxa currently presented in this manuscript.

Among *Astragalus* specimens received as a gift for determination from the New York Botanical Garden, the following new species from Peru was found.

1. Astragalus sagasteguii Gómez-Sosa, sp. nov. TYPE: Peru. Cajabamba, Cajamarca, jalca, 3800 m, 17 Nov. 1983, *A. Sagástegui Alba et al. 11181* (holotype, SI; isotypes, F, MO, NY). Figure 1.

Habitus prostratus-pulvinatus, pubescens; stipulis amplexicaulibus, pubescentibus; foliola 15 ad 17, elliptico-cuneata, apice retuso; 1(ad 2) flores parvi, calyx 4 mm; vexillum ultra unguem obovatum 7–8 mm longum; legumen 0.3 × 0.2 cm, subglobosum, subbiloculare, cum margine dorsale inflexo 1 mm lato et cum margine membranaceo inconspicuo 0.5 mm lato solum basi; semina 1 ad 2, reniformia.

Depressed-pulvinate herb, 4–16 cm diam., acaulescent, the stoutly branched caudex 4–8 cm, stipules amplexicaul, membranous, densely sericeous-villous. Leaves to 1.4 cm long; leaflets 15 to 17, opposite, decrescent distally, folded, in outline elliptic-cuneate, retuse, subsessile, 2.5–3 × (1–)1.5 mm, cinereous-villous trichomes 0.5–1 mm long. Bracts subulate 2.5 × 1 mm; bracteoles 2 × 0.5 mm, pubescent, ciliate; flowers purple 1(to 2), subsessile, 8–9 mm long; calyx 4 mm, villous, tube 2 mm long, teeth subulate, 2 mm; banner 8 × 6 mm, obovate; wings 5 × 1.5 mm, the claws included; keel 4 mm; ovary substipitate, scattered pilose, style glabrous, incurved at apex, the stigma capitate; ovules 2. Legume evanescent, subglobose, 0.3 × 0.2 cm, truncate at base, apex rounded, valves membranaceous, inflexed below middle of pod, with an incipient septum to 0.5 mm only at base, obsolete in the apical half of the dorsal suture, commonly concealed by petals, bract, and mature stipule; seed 1 or 2, reniform, brown, generally mottled.

Etymology. This species is dedicated to the type collector, Abundio Sagástegui Alba, professor

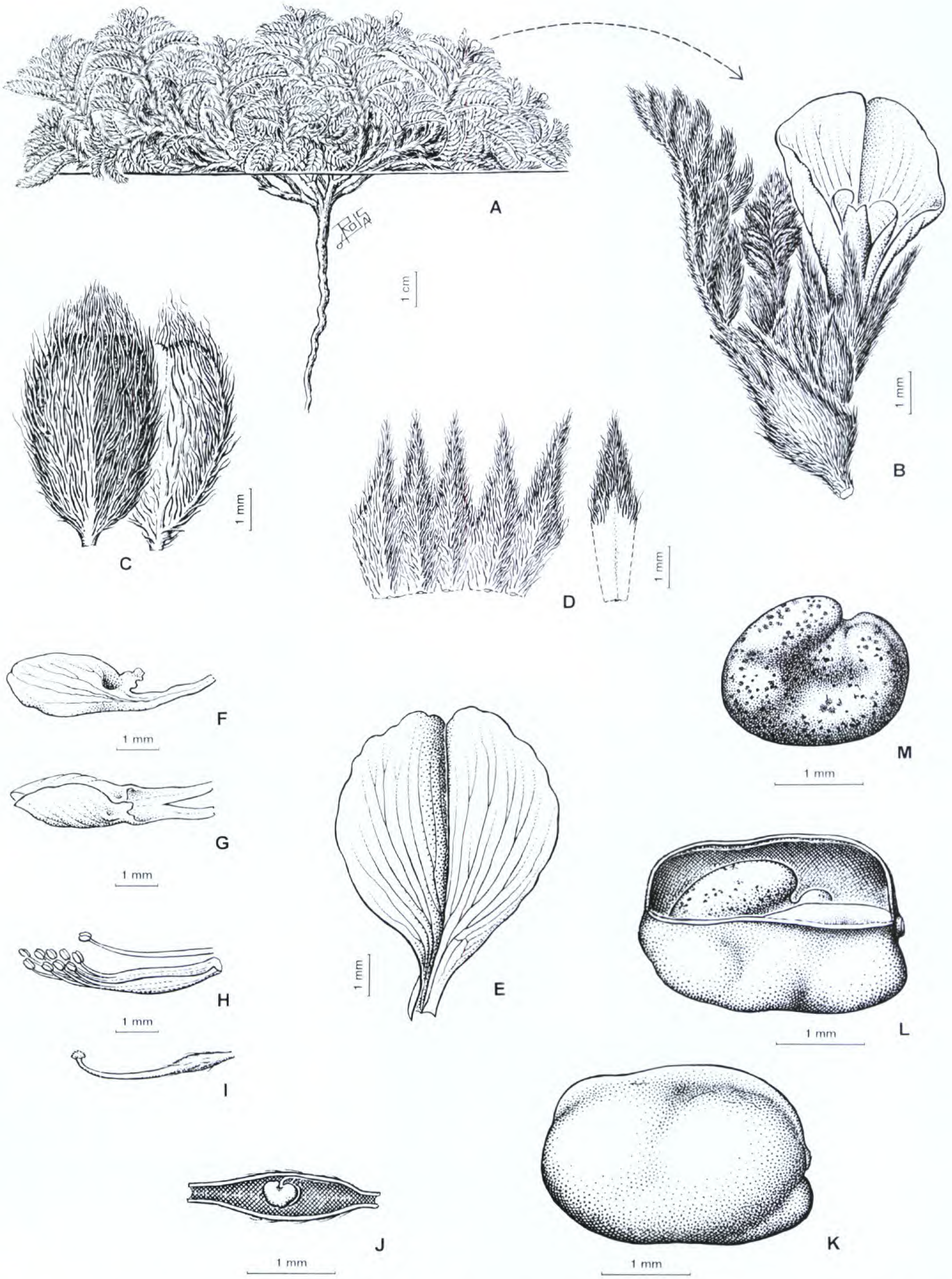

Figure 1. *Astragalus sagasteguii* Gómez-Sosa. —A. Plant habit. —B. Apex of branch with flower. —C. Leaflets, below and above. —D. Calyx and internal pubescence of the teeth. —E. Banner. —F. Wing. —G. Keel. —H. Androecium. —I. Gynoecium. —J. Ovary, longitudinal section. —K. Fruit, lateral view. —L. Fruit, longitudinal section, with an incipient septum only at the base. —M. Seed. Based on *Sagástegui et al. 11181* (holotype, SI).

Table 1. Comparison of *A. sagasteguii*, *A. diminutivus* var. *diminutivus*, and *A. dillinghami*

	A. sagasteguii	*A. diminutivus* var. *diminutivus*	*A. dillinghami*
Leaves			
Length (cm)	to 1.4	1–2	1.5–2
Leaflets			
Number	15 to 17	13 to 17(to 19)	9 to 13
Size (mm)	2.5–3 × (1–)1.5	1.5–2 × 0.6–1	4 × 2
Shape	elliptic-cuneate	elliptic to subcircular	ovate-lanceolate
Apex	retuse	obtuse to slightly retuse	acute
Pubescence	cinereous-villous on both surfaces	glabrous above/villous below	silvery-villous on both surfaces
Trichome length (mm)	0.5–1	0.5–1	1.5–2.5
Flowers			
Number	1(to 2)	1(to 2)	4 to 8
Length (mm)	8–9	7–9	8–10
Calyx length (mm)	4	3–4	7
Legume	subbilocular septum to 0.5 mm only at base	unilocular	unknown

and director of the Natural History Museum (HAO) at Antenor Orrego University, Trujillo, Peru. He is an enthusiastic collector and student of the Peruvian flora.

Habitat and distribution. *Astragalus sagasteguii* occurs in "jalca" in the Andean mountains of Peru, which refers to the ecological zone along the Andean divide between the drier Paramo to the north and the wetter Puna to the south. Found above 3300 m, the jalca vegetation is predominantly grassland, and the predominant grass is "ichu" [*Stipa ichu* (Ruiz & Pavón) Kunth]. Native fauna include frogs, lizards, birds, small mammals, and deer.

Climate. The climate of the this new species is typical of Andean regions near the equator: cool and humid, with a distinct rainy season. Temperatures are relatively constant throughout the year, and seldom dip below freezing even at the highest mountain elevations. Conditions are often windy, especially at higher elevations. The climate is characterized by a distinct rainy season (October to April) followed by a dry period (May to September).

The genus *Astragalus* is represented by 23 species (Zarucchi, 1993) in the flora of Peru. The new species *A. sagasteguii* is in close relationship with *A. dillinghami* J. F. Macbride "depressed, compact,. . . flowers crowded or few in the axils, about 1 cm long. . ."(Macbride, 1943: 396). Moreover, *A. dillinghami* is distinguished by its 4 to 8 flowers, leaflets ovate-lanceolate with acute apex, and a silvery-villous pubescence with trichomes 1.5–2.5 mm long.

In addition, *Astragalus sagasteguii* appears to be related to *A. diminutivus* (Philippi) Gómez-Sosa from Peru, Bolivia, and Argentina, which it resembles by having a single flower that is 7–9 mm long. In contrast *A diminutivus* has smaller leaflets that are sericeous-pubescent, especially on the unilocular legume. (See Table 1 for a comparision of these three species.)

A critical examination of the type collections of *Phaca diminutiva* Philippi from northern Chile, *Astragalus deminutivus* I. M. Johnston from southern Bolivia, and *A. dielsii* J. F. Macbride from Lima, in northern Peru, reveals that the following new combination should be recognized.

2. **Astragalus diminutivus** (Philippi) Gómez-Sosa, comb. nov. Basionym: *Phaca diminutiva* Philippi, Anales Mus. Nac. Santiago de Chile, 2° Sección, Cat. Pl. Itin. Tarapacá 14. 1891. TYPE: Chile. "inter Aguas Calientes et Socaire, *R. A. Philippi s. n.* (holotype, SGO; isotype, SI). Figure 2.

Astragalus deminutivus I. M. Johnston, J. Arnold Arbor. 28: 406. 1947. Syn. nov. TYPE: Bolivia. Tarija: Puna de Patanca, 3700 m, 7 Jan. 1904, *K. A. Fiebrig 2608* (holotype, GH; isotypes, K, P, SI).

Because of the very short original diagnosis of this taxon (Philippi, 1891) a more complete description of the type variety is given here.

Figure 2. *Astragalus diminutivus* (Philippi) Gómez-Sosa var. *diminutivus*.—A. Plant habit. —B. Apex of branch with flowers. —C. Leaflets, below and above. —D. Calyx and internal pubescence of the teeth. —E. Banner. —F. Wing. —G. Keel. —H. Androecium. —I. Gynoecium. —J. Fruit, longitudinal section. —K. Seed. *Astragalus diminutivus* var. *dielsii* (J. F. Macbride) Gómez-Sosa. —L. Leaflets, below and above. A–D based on *J. H. Hunziker 10503*; E–K, *Macbride & Featherstone 2479* (isotype, SI); L, *V. Cabezas 60*.

Astragalus diminutivus (Philippi) Gómez-Sosa var. **diminutivus**

Herb cespitose, 2–8 cm diam., green-cinereous, caudex 1–2(–3) cm, with membranous stipules imbricate, white-pubescent, 2.5–3.5 mm long. Leaves 1–2 cm long, petiole 0.2–0.5 mm long; leaflets 13 to 17(to 19), elliptic to subcircular, 1.5–2 × 0.6–1 mm, obtuse to slightly retuse at apex, thickened, folded, glabrous above, villous-pubescent below, covered with trichomes 0.5–1 mm long. Bracts triangular-ovate, 1.5–3(–4.5) mm long; bracteoles the same length, filiform, both pubescent and ciliate; flowers 1(to 2) erect, sessile, blue to light blue; calyx pubescent, tube campanulate, 2–2.5 mm long, teeth subulate, 1–1.5 mm long; banner 6–8 × (2.5–)3–4.5 mm, obovate to widely obovate, emarginate at the apex, basally narrowed to claw; wings 5–6(–8) × 1–1.5 mm, rectangular, obtuse; keel 4.5–5 mm long; ovary shortly stipitate, pubescent, style glabrous, laterally compressed and inflexed at apex, stigma minutely-capitate; ovules 2(to 4). Legume membranaceous, evanescent, subglobose, 0.2–0.25 × 0.2–0.25 cm, unilocular, covered by remains of bracts and perianth; seed 1, subglobose, sometimes mottled, hilum apical, 2–2.5 × 2–2.5 mm.

Distribution and habitat. A regional endemic in western South America, cited for Peru and reported now with a southern range extension to Bolivia, Chile, and northwest Argentina, inhabiting higher elevations 3600–4300 m. Collector's notes (*R. Ehrich 75*) indicate it occurs on sandy or clayey limestone.

Climate. This region is in the biogeographic province of Puna (Cabrera & Willink, 1973) between 15° and 27° S, with the Andean mountains to the west and the "Cordillera Real" mountain range to the east at elevations of 3200 to 4000 m. Moreover, the Puna is in the Neotropical subregion (Crisci et al., 2000). The climate of this region is dry and cold, with a large contrast in temperature and rainfall during the year. The principal rainfall occurs only in summer, varying from approximately 700 to 50 mm, decreasing along gradients from north to south and from east to west.

Additional specimens examined. BOLIVIA. **Tarija:** Lago Taxara, *R. Ehrich 75* (LPB, SI). **Potosí:** Porco, Uyuni, *E. Asplund 3137 & 3138* (UPS). **La Paz:** Pacajes, Gral. Campero, *E. Asplund 2780* (UPS); Sur Chichas, Atocha, *E. Asplund 3025* (UPS). ARGENTINA. **Jujuy:** Humahuaca, Lag. Tres Cruces, *F. Claren 11657* (SI, STOCK); Cochinoca, *V. Cabezas 60* (SI); Abra Pampa, N Mina Aguilar, *E. Ancibor & B. Mujica 18* (BAA); Yavi, Cerro Negro, *T. Meyer 31462* (LIL, SI); arriba de Rincón de Cajas, *H. Sleumer 3618* (LIL, SI). **Salta:** Caldera, subida al Nevado del Castillo, Tres Lagunas, *H. Sleumer et al. 2981* (LIL, SI).

2a. Astragalus diminutivus (Philippi) Gómez-Sosa var. **dielsii** (J. F. Macbride) Gómez-Sosa, stat. nov. Basionym: *Astragalus dielsii* J. F. Macbride., Publ. Field Mus. Nat. Hist., Bot. Ser. 11: 24. 1931. TYPE: Peru. Ancash, Yanashallas, Estación 35 mi. W of Huallanca, 2 Oct. 1922, "loose stony slopes, light blue fls., about 16,000 ft., the parts spreading," *J. F. Macbride & W. Featherstone 2479* (holotype, FM; isotype, SI). Figure 2L.

Astragalus diminutivus var. *dielsii*, with leaflets pubescent above as well as below is thereby distinguished from *A. diminutivus* var. *diminutivus*.

Distribution and habitat. Found in western Peru, Bolivia, and Argentina, in high mountains at elevations of 3600–4400 m.

Additional specimens examined. BOLIVIA. Laguna de Potosí, *D'Orbigny 1432* (P). ARGENTINA. **Jujuy:** Cochinoca, Abra de Rachaite, *M. Múlgura et al. 1311* (SI); Casabindo, *N. Deginani et al. 520* (SI); Humahuaca, Mina Aguilar, arriba del Molino, *H. Sleumer 3428* (LIL, SI), *J. H. Hunziker et al. 10503* (SI); Tres Cruces, *A. Soriano 653* (SI); Susques, al pie del cerro Tuzle, *A. Cabrera 8644* (SI), *A. Cabrera 8748* (LP, SI); Abra Chorrillos, *A. Cabrera et al. 31774* (SI); Rinconada, Ruta provincial 746, 13 km de Mina Pirquitas camino a Coranzulí, *O. Morrone et al. 2589* (SI).

The name *Phaca diminutiva* Philippi was cited by I. M. Johnston (1947: 407) as an "unplaced species," because he had not seen the type specimen from Chile. In the same paper Johnston published *Astragalus deminutivus*, a new species for Bolivia and Argentina, with similar vegetative and floral characteristics to the ones that encompass *P. diminutiva*. The legume was described by Johnston (1947: 406) as "subglobosis ca. 2 mm longis et 1.5 mm crassis subtus introflexis" or as a subbilocular legume. A critical examination of the *Astragalus deminutivus* type collections at FM, GH, K, and P in addition to cited specimens of E. Asplund (UPS) reveals the legume is without inflexion of the suture, and thus the fruit is unilocular; these collections otherwise share the same characteristics as *A. diminutivus*. The Philippi type locality of *Phaca diminutiva* is noted between Aguas Calientes to Socaire, in northern Chile, east of the Salar of Atacama, at 5030–5070 m near the political boundary with Argentina, in Provinces of Jujuy and Salta, and in the vicinity of the Tropic of Capricorn, within the same distributional area as *A. deminutivus*.

Acknowledgments. I thank the directors and curators of FM, GH, K, LP, LIL, M, NY, P, SGO, and

UPS for their loans of the cited material and also for the cordial attention during my visit to each of the herbaria. I thank the artist, Francisco Rojas, for the drawing. I am also grateful to Jan Saunders for helping me with the revision of the English version. My special gratitude to Victoria C. Hollowell and an anonymous reviewer for offering careful suggestions toward its revision. Herbarium visits were supported by a grant from CONICET (National Council for Scientific and Technological Research) of Argentina and aid from American and European institutions.

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Two New Species of *Mikania* (Asteraceae, Tribe Eupatorieae) from Tropical America

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ABSTRACT. *Mikania pooleana*, known only from Oaxaca, Mexico, is similar to *M. tonduzii* of Mexico and Central America, but distinguished by its lanceolate leaves and hemispherical glomerules. The latter species has ovate to broadly ovate leaves and spherical glomerules. *Mikania saxicola* of Minas Gerais, Brazil, is characterized by its dense spike-like capitulescence, small heads about 4.5 mm long, and cypselae with forked trichomes. It has affinity to *M. microlepis*, also of Brazil, which is distinguished by its dense fulvous-tomentose nature, larger heads, and lack of forked trichomes.

Key words: Asteraceae, Eupatorieae, *Mikania*, tropical America.

Mikania pooleana W. C. Holmes & Vodopich, sp. nov. TYPE: Mexico. Oaxaca: ca. 21 mi. S of Valle Nacional, Hwy. 175 (Tuxtepec–Oaxaca), infrequent vine, with tree ferns, 13 Mar. 1980, *J. M. Poole 2247 & J. A. McDonald* (holotype, TEX). Figure 1.

Haec species *M. tonduzii* similis sed in foliis lanceolatis differt.

Twining vines. Stems terete, striate, glabrate, solid. Leaves lanceolate, 7.5–12 × 1.9–3.6 cm; apex caudate to caudate acuminate, margins entire in the basal half, remotely serrate-denticulate in the upper half, the teeth 0.7–2 cm distant, base acute to acute-acuminate, surfaces glabrate, venation trinervate with a conspicuous pair of lateral nerves separating near 1 cm from the base of the blade, these accompanied by another pair of obscure nerves separating within 5–8 mm of the base of the blade, tertiary nerves obscure, disposed in a slightly antrorse-orientated transverse pattern; petioles 2–2.5 cm long, glabrous. Capitulescence an elongate pyramidal panicle, 19 × 7.5 cm; branchlets glabrate at base, puberulent above; bracts lanceolate to linear, much reduced in size above; capitula ca. 7 mm long, disposed in somewhat dense hemispherical glomerules 2–3 cm diam., ultimately the heads in sessile cluster of threes. Subinvolucral bracts linear, 1–2 mm long, puberulent. Phyllaries 4, elliptic-oblong, ca. 3.5 mm long, the base fused for about 1 mm, surfaces glabrous, apex rounded to obtuse, puberulent. Florets 4. Corollas ca. 6 mm long, white, tube 2–3 mm long, slightly bulbous at base, gradually expanded into the funnelform throat, 2–2.5 mm long, teeth deltate, ca. 0.8 mm long, sparingly glandular. Cypselae tawny, ca. 2 mm long, glabrous, the faces reticulated. Pappus bristles white, 21 to 33, ca. 4.5 mm long, margins scabrid, apex slightly thickened.

In Holmes (1990), this new species keys to the vicinity of *Mikania tonduzii* B. L. Robinson and *M. globosa* Coulter, which appear to be its nearest relatives. These two species have ovate to broadly ovate leaves and heads disposed in very dense spherical glomerules. In contrast, *Mikania pooleana* has lanceolate leaves and hemispherical glomerules. Additionally, *M. globosa* has phyllaries that completely envelop the adjoining floret it subtends. The ultimate disposition of the capitula in sessile clusters of threes is unusual for *Mikania* with pyramidal capitulescences. This arrangement is typical of the *Mikania parviflora* (Aublet) Karsten complex (Robinson, 1922a). Additional characteristics of this complex are corymbose capitulescences and densely hirsute style appendages and bases. *Mikania pooleana* has none of these traits, which suggests that this head arrangement arose independently in other *Mikania* and does not indicate relationship.

Using the classification proposed by Holmes (1996), *Mikania pooleana* is in *Mikania* sect. *Mikania*. This is determined from its subinvolucral bracts that are borne at the very base of the involucres and from the maturation pattern of the capitula of the hemispherical glomerules from the center to the periphery.

Mikania pooleana is known only from the type material.

We are privileged to name this species to commemorate the collector, Jackie M. Poole. Poole, an employee of Texas Parks and Wildlife Department, has been a pre-eminent botanist concerned with preserving the native flora of Texas.

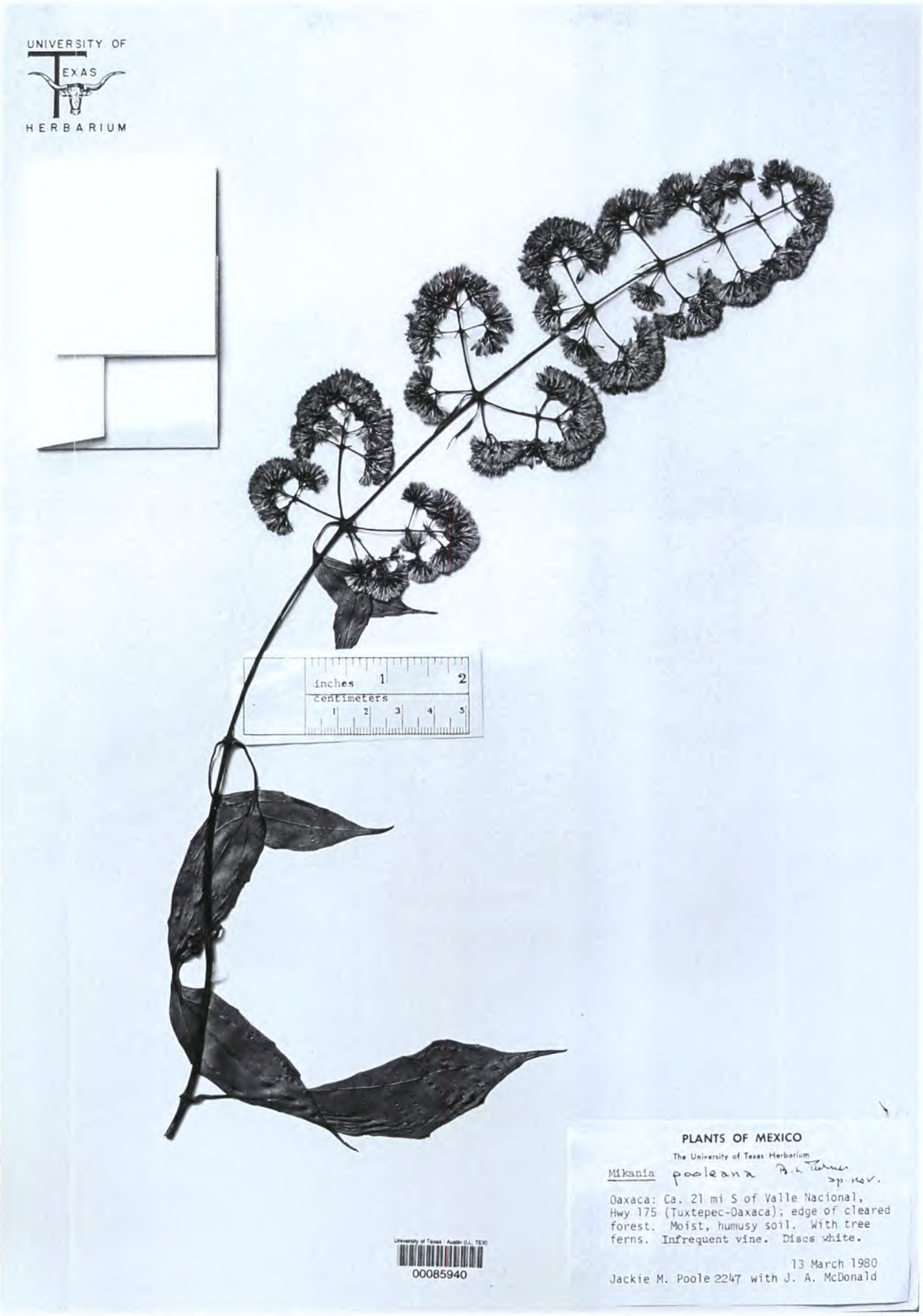

Figure 1. Photograph of the holotype of *Mikania pooleana* W. C. Holmes & Vodopich.

Mikania saxicola Schultz-Bip. ex W. C. Holmes & Vodopich, sp. nov. TYPE: Brazil. Minas Gerais, Serra do Chapada, June 1827, *L. Riedel s.n.* (holotype, NY). Figure 2.

Haec species *M. microlepis* similis sed in planta glabra differt.

Semiwoody vine. Stems terete, striate-costate after drying, glabrous. Leaves deltate, 3.5–6 × 2.4–

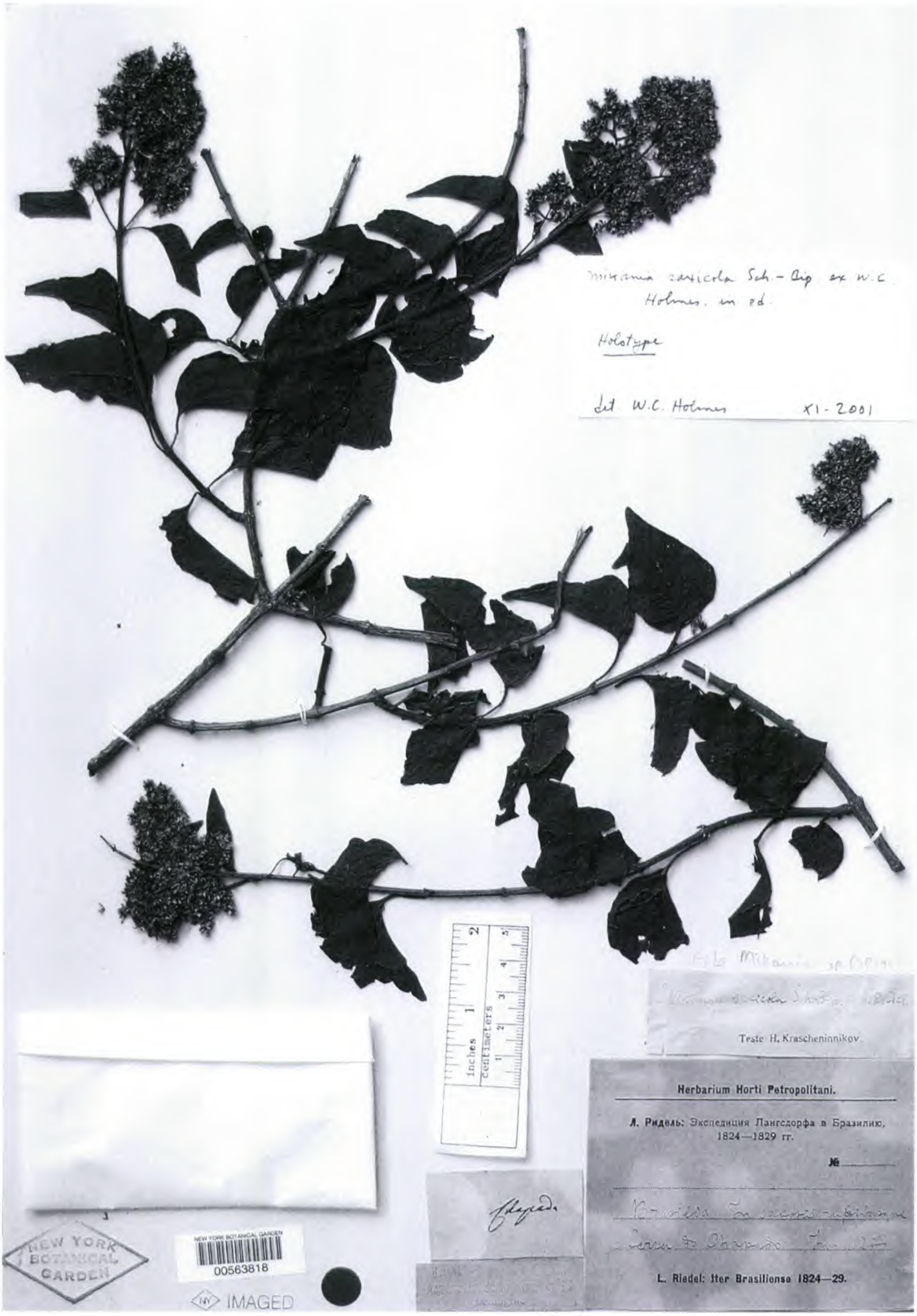

Figure 2. Photograph of the holotype of *Mikania saxicola* Schultz-Bip. ex W. C. Holmes & Vodopich.

3.5 cm, apex acute to a rounded point, margins entire, occasionally with two bluntish-rounded basal lobes to ca. 3 × 5 mm, base cuneate, palmately 3- to 5-nerved from insertion of the petioles; surfaces glabrous, reticulate, the lower surface densely glandular; petioles 0.8–1.7 cm long, glabrate. Capitulescence paniculate, dense, 7 × 4.5 cm; branchlets irregularly angled to subterete, puberulent, glandular; bracts at base of capitulescence similar to leaves but reduced in size, those at summit lin-

ear. Capitula ca. 4.5 mm long, ultimately disposed in spikelike racemes ca. 5 mm long, usually numbering 4 to 6 capitula. Subinvolucral bracts lance-elliptic, ca. 1.5 mm long, puberulent, glandular, apex acute. Phyllaries obovate, 1.8–2 mm long, glabrate to puberulent, sparingly glandular, margins in the distal half finely serrate-ciliate. Corollas ca. 2.2 mm long; tube ca. 0.8 mm long, throat funnelform to semicampanulate, ca. 1 mm long, lightly glandular; teeth deltate-ovate, ca. 0.2 mm long, glandular. Cypselae ca. 1.5 mm long, puberulent, densely so at the summit, the trichomes sometimes forked or branched at the apex. Pappus bristles white, 1–1.4 mm long, 15 to 20, margins scabrid, apex occasionally slightly thickened.

Mikania saxicola is characterized by its congested capitulescence with the capitula borne in short spikelike racemes, heads ca. 4.5 mm long, which is small for the genus, and presence of branched or forked trichomes on the cypselae. The latter trait is very unusual in the genus and in the Eupatorieae, being reported by Holmes and Pruski (2000) as dendroid pubescence in *M. wurdackii* Pruski & W. C. Holmes. Similar trichomes are also known from *M. citriodora* W. C. Holmes (Holmes, 1991) and from *M. grazielae* R. M. King & H. Robinson (King & Robinson, 1980), both of Brazil. In these two species, the forked trichomes appear to represent an additional and modified pappus, since they are borne primarily near the summit of the cypselae. However, the forked trichomes of *M. saxicola* occur on all parts of the cypselae.

The disposition of capitula into short spike-like racemes indicates that the species belongs to *Mikania* sect. *Summikania* W. C. Holmes (Holmes, 1996). In Barroso's (1959) treatment of the *Mikania* of Brazil, *M. saxicola* could be included in section *Globosae* B. L. Robinson (Robinson, 1922b) because of its densely congested capitulescence, or, with equal facility, in section *Spicato-racemosae* Baker (Baker, 1876), because of disposition of the heads into short spike-like racemes. This ambiguity, which is responsible for Barroso's classification not gaining general acceptance, is discussed in Holmes (1996).

Mikania saxicola appears similar to *M. microlepis*, also of Brazil. *Mikania microlepis* is characterized by its dense fulvous-tomentose nature, larger heads, and lack of forked trichomes.

Mikania saxicola is known only from the type specimen. The holotype was a gift from L to NY presented in about 1990 (John Pruski, pers. comm.). It is not known if duplicates exist at L. The type specimen was annotated as "*Mikania saxicola* Sch.-Bip. in h. Riedel," by H. Krascheninnikov, a name never validated through publication.

Acknowledgments. We thank the curators of the herbaria for their loans of specimens that made this study possible. We are also indebted to Billie L. Turner for bringing to our attention that *Poole 2247* (holotype of *Mikania pooleana*) was an undescribed species. Also, John Pruski provided information about the type specimen of *Mikania saxicola*.

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Una Nueva Especie de México y Centroamérica, *Marsdenia hiriartiana* (Apocynaceae, Asclepiadoideae, Marsdenieae)

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RESUMEN. Una nueva especie, *Marsdenia hiriartiana* es descrita e ilustrada. Esta especie es similar a *Marsdenia macrophylla* (Humboldt & Bonpland ex Schultes) E. Fournier y *M. altissima* (Jacquin) Dugand pero se distingue de la primera por presentar hojas suborbiculares a orbiculares y folículos entre 22 y 30 cm de largo, y de la segunda por ser glabra y tener una inflorescencia laxa y el tubo y los lóbulos de la corola más o menos del mismo tamaño.

ABSTRACT. A new species, *Marsdenia hiriartiana*, is described and illustrated. This species is similar to *Marsdenia macrophylla* (Humboldt & Bonpland ex Schultes) E. Fournier, and *M. altissima* (Jacquin) Dugand, but it is distinguished from the first by its suborbicular to orbicular leaves and follicles 22 to 30 cm long, and from the second because it is glabrous and has a lax inflorescence and a corolla tube approximately equaling the corolla lobes.

Key words: Apocynaceae, Asclepiadoideae, Central America, Marsdenieae, *Marsdenia*, Mexico.

Marsdenia hiriartiana Juárez Jaimes & W. D. Stevens, sp. nov. TIPO: Guatemala. Petén: Tikal National Park, in ramonal covering the ruins, 8 June 1959 (fl), *C. Lundell 16062* (holotipo, LL; isotipo, MEXU). Figura 1.

Folia suborbiculata. Inflorescentia umbelliformis laxa, pedicellis 9.0–13.0 mm longis; calycis lobi 2–3 glandibus in quoque sinu; corollae lobi 6.0 mm longi. Folliculus plus quam 20 cm longus.

Plantas con látex blanco. Tallos glabros, ramas 7.0 mm de ancho, glabras, lenticeladas. Hojas 11.5–22.0 × 9–20 cm, suborbiculares a orbiculares, con 7–8 pares de nervios secundarios, base cordada, ápice cortamente acuminado, membranáceas, haz glabra o con tricomas adpresos muy esparcidos, con 6 a 8 coléteres en la base del limbo sobre el nervio medio, envés con zonas con tricomas adpresos amarillos y zonas glabras; pecíolo 3.5–6.0 cm de largo, glabro. Inflorescencia umbeliforme, con 12 a 20 flores; pedúnculo 1.0–1.4 cm, puberulento; brácteas lanceoladas, glabrescentes; pedicelos 0.9–1.3 cm, glabrescentes; lóbulos del cáliz ca. 6.0 × 3.3 mm, anchamente elípticos, la superficie adaxial glabra con 2 o 3 glándulas en cada seno, superficie abaxial glabrescente; corola campanulada 0.8–1.0 cm de diámetro, lóbulos ca. 6.5 × 3 mm, oblongos; tubo ca. 6.0 mm de largo; ginostegio ca. 4 mm de largo; corona estaminal con lóbulos ca. 3.5 mm de largo, oblongo-truncados, ápice agudo; membranas de las anteras ca. 2.0 mm de largo; anteras ca. 1.3 mm de largo, oblongas; corpúsculos ca. 0.6 mm de largo; polinios ca. 1.2 mm de largo, elipsoidales a oblongos; ápice del estilo 1.5–2.0 mm, anchamente cónico con pliegues espiralados, obtuso; carpelos glabros. Folículos 22–30 × 4–8 cm, muy angostamente elipsoidales; semillas ca. 1.3 × 8 cm, de forma irregular, bordes trasparentes, con una línea media muy marcada, coma ca. 6 cm, blanca.

Marsdenia hiriatiana está relacionada morfológicamente con *Marsdenia altissima*, puesto que ambas tienen hojas suborbiculares a orbiculares, entre 9 y 22 cm de largo, pedúnculos de alrededor de 1 cm de largo, y tubo de la corola de más de 4.5 mm de largo, sin embargo, *M. hiriartiana* se distingue por sus hojas glabrescentes, inflorescencia laxa, así como por la presencia de 2 a 3 coléteres en cada seno de los lóbulos del cáliz, lóbulos de la corola casi del mismo tamaño que el largo del tubo de la corola, ápice del estilo 1.5–2 mm de largo, folículos glabros, lisos y leñosos. Por otro lado *M. hiriartiana* se conoce sólo del norte de Mesoamérica, mientras que *M. altisima* se distribuye desde el norte de Colombia, Venezuela hasta Argentina.

Marsdenia hiriartiana fue por mucho tiempo considerada como *Marsdenia macrophylla* o miem-

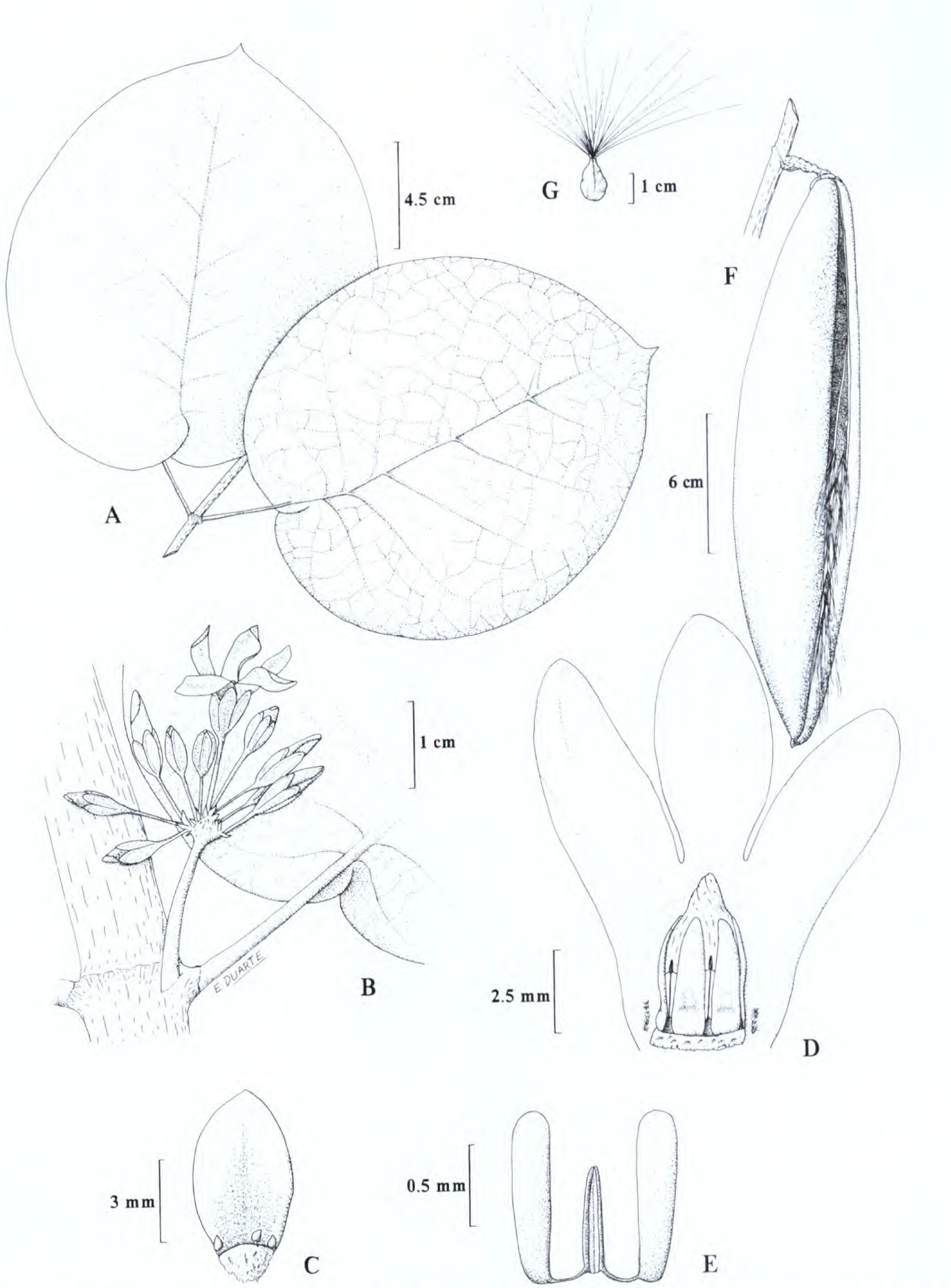

Figura 1. *Marsdenia hiriartiana* Juárez-Jaimes & W. D. Stevens. —A. Hojas. —B. Inflorescencia. —C. Lóbulo del cáliz con coléteres. —D. Corola, ginostegio y corona estaminal. —E. Polinario. —F. Fruto. —G. Semilla. Dibujo del tipo, *Lundell* 16062 (LL).

Tabla 1. Resumen de caracteres morfológicos entre *Marsdenia hiriartiana* y especies morfológicamente cercanas.

Caracteres	*M. hiriartiana*	*M. altissima*	*M. macrophylla*
Hoja			
láminas (cm)	11.5–22 × 9–20	9–22 × 9–16	11.5–20 × 5–13
pecíolos (cm)	3.5–6	4–7	2.0–3.0
forma	suborbicular a orbicular	anchamente ovada a suborbicular	elíptica a anchamente elíptica
pubescencia	haz glabra, pelos adpresos muy esparcidos	haz densamente tomentosa, envés tomentoso-velloso	haz y envés glabros en hojas adultas
Inflorescencia			
no. de flores	12 a 20	10 a 30	18 a 25
pedúnculos (mm)	10–14	8–10	5–13
pedicelos (mm)	9–13	2–6	5–8
no. de coléteres	2–3 en c/seno	sin glándulas	1 en c/seno
largo del tubo de la corola (mm)	6.0	4.5–6	3.4–3.8
largo de los lóbulos de la corola (mm)	6.5	2.4–3	3.6–5.3
largo del ginostegio (mm)	4	2.3–3	4.5
largo de los lóbulos de la corona (mm)	3.5	1.3–1.6	2.5–3.9
largo de las anteras (mm)	1.3	0.5	1.2
largo de los corpúsculos (mm)	0.6	0.15–0.18	0.5
largo de los polinios (mm)	1.2	0.7	1.1
largo del ápice del estilo (mm)	1.5–2.0	0.6	1.0–1.2
forma del estilo ápice del estilo	anchamente cónico obtuso	cónico obtuso	cónico obtuso
Fruto			
largo (cm)	22–30	16–22	15–17
ancho (cm)	4–8	3.5–6	4–5
forma	angostamente elipsoidal	ovoide-cilíndrico	angostamente elipsoidal
textura y pubescencia	glabro leñoso y liso	densamente piloso y aterciopelado, pericarpio grueso y duro	glabro leñoso y liso

bro del complejo de especies reconocido como *M. macrophylla* (Standley & Williams, 1968), pero *M. hiriartiana* se distingue por sus hojas suborbiculares a orbiculares, pedúnculos de más de 1 cm de largo, presencia de 2 a 3 coléteres en cada seno de los lóbulos del cáliz, tubo y lóbulos de la corola de 6 mm de largo, y folículos de más de 22 cm de largo. *Marsdenia macrophylla* se distingue por sus hojas más pequeñas, elípticas a anchamente elípticas, tubo y lóbulos de la corola hasta de 4.5 mm de largo y folículos hasta de 17 cm de largo. *Marsdenia macrophylla* se encuentra desde Costa Rica hasta Sudamérica. En la Tabla 1 se resumen las características morfológicas de estas 3 especies.

Es importante señalar que C. L. Lundell ya había reconocido como una nueva especie al material por él recolectado, pero nunca publicó el nuevo taxón.

Distribución. Hasta el momento *Marsdenia hiriartiana* se conoce desde Chiapas en México hasta Honduras.

Marsdenia hiriartiana Juárez-Jaimes & W. D. Stevens se dedica a la memoria de Patricia Hiriart, botánica mexicana estudiosa de la vegetación del nordeste de México, maestra y amiga.

Paratipos. MÉXICO. **Chiapas:** 5 km NW of Tumbo, *W. Stevens & E. Martínez 25886* (MO). GUATEMALA. **Escuintla:** below Las Lajas, *P. Standley 64768* (F). **Petén:** Tikal, Tikal National Park, *C. Lundell 15358* (LL), *C. Lundell 17089* (LL); Uaxactum, *H. Bartlett 12555* (F, MO), *C. Lundell 16638* (LL). HONDURAS. **Atlántida:** Lancetilla Valley, near Tela, *P. Standley 54867* (F).

Agradecimientos. A Patricia Dávila, Miguel Ortiz y Fernando Chiang por la revisión crítica del manuscrito. A este último también por su ayuda en la descripción en latín.

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Standley, P.C. & L. O. Williams. 1968. Asclepiadaceae. *En:* Flora of Guatemala. Fieldiana, Bot. 24(8, part 4): 407–472.

A New Species of the Genus *Actinodaphne* with Four New Synonyms of the Genus *Litsea* (Lauraceae)

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ABSTRACT. Work in progress for the Lauraceae volume of the *Flora of China* has yielded one undescribed species and several new synonyms. In this contribution, a new species, *Actinodaphne menghaiensis* J. Li, is described from Yunnan, Southwest China, and its affinities are discussed. Four new synonyms are proposed: *Litsea garrettii* Gamble, *L. euosma* W. W. Smith, *L. atrata* S. Lee, *L. magnoliifolia* Yang & P. H. Huang for *L. martabanica* (Kurz) Hooker f., *L. mollis* Hemsley, *L. salicifolia* (Nees) Hooker f., *L. semecarpifolia* (Nees) Hooker f., respectively. Lectotypes are designated for *Litsea garrettii* Gamble, *L. mollis* Hemsley, and *L. euosma* W. W. Smith.

Key words: *Actinodaphne*, China, Lauraceae, *Litsea*.

Lauraceae are a large tropical family of trees and shrubs with small and inconspicuous flowers, which has rendered the family inaccessible for the non-specialist. Although the Chinese species of Lauraceae have been reported in the *Flora Reipublicae Popularis Sinicae* (FRPS) (Li et al., 1984), the taxonomic treatments are incomplete and poorly understood because of the insufficient knowledge about infraspecific variation and distribution, as well as specific delimitations, and the entire family in China needs much work. During the preparation of the Lauraceae treatment for the *Flora of China*, a large number of Lauraceae specimens in KUN and the collections received on loan from various herbaria (E, K, IBSC, YUKU) have been examined. As a result, one previously undescribed species is presented here, and four synonyms are made. They are arranged in alphabetical sequence.

Actinodaphne menghaiensis J. Li, sp. nov. TYPE: China. Yunnan: Jin-bo-a-ka village, Meng-a district, Meng-hai, in dense humid valley forest, 1500 m, 10 Sep. 1961, *Y. H. Li 3603* (holotype, KUN). Figure 1.

Actinodaphne obovatae affinis, sed gemmis, ramulis foliisque glabris; fructibus minoribus, ad 2.5 × 1.5 cm; pedunculis fructiferis gracilioribus, ad 1 cm longis, ca. 2 mm in diam. differt.

Tree, 8 m tall; twigs terete, ca. 0.8–1.2 cm diam., glabrous; terminal buds sub-globose, brownish glabrous. Five to six leaves verticillate at the top of branchlets; lamina thin coriaceous, obovate or elliptic, 15–30(–40) × 6–12(–15) cm, the base cuneate, the apex acuminate, both surfaces glabrous, lucid on the upper surface, pale green on the lower surface, triplinerved; midrib prominently raised on both surfaces; lateral veins 7 or 8 on each side, 2 basal lateral veins beginning at ca. 0.2–1.2(–1.5) cm of the leaf base, the parallelodromous tertiary veins slightly raised on the lower surface. Petioles 2–4(–6) cm long, glabrous. Flower unknown. Infructescences racemiform, up to 4 cm long, with yellow-brown pubescence. Fruit ellipsoid, up to 2.5 cm long, 1.5 cm diam., becoming purple-red when mature; cupule flat, up to 1 cm diam.; fruit pedicel slender, up to 1 cm long, ca. 2 mm diam. Fruiting in September.

In the past, *Actinodaphne obovata* (Nees) Blume was erroneously supposed to be distributed in Northeast India, Southeast Tibet, South and Southeast Yunnan (Hooker, 1886; Li et al., 1984). After a careful study of the collection from South Yunnan, we have found that it is not the same as those from Northeast India, Southeast Tibet, and Southeast Yunnan that have rusty pubescence on the branchlets and leaves. In fact, *A. obovata* is distributed at both ends of the Tanaka-Line (Tanaka, 1954; Li & Li, 1997); the same distribution pattern can be seen in *Litsea chingpingensis* Yang & P. H. Huang (Li & Pai, 1983), *Dipterocarpus retusus* Blume (Li et al., 2002), and so on. Such a distribution pattern may be a result from the northward movement of the Burma-Malaya plate (Audley-Charles, 1987). The

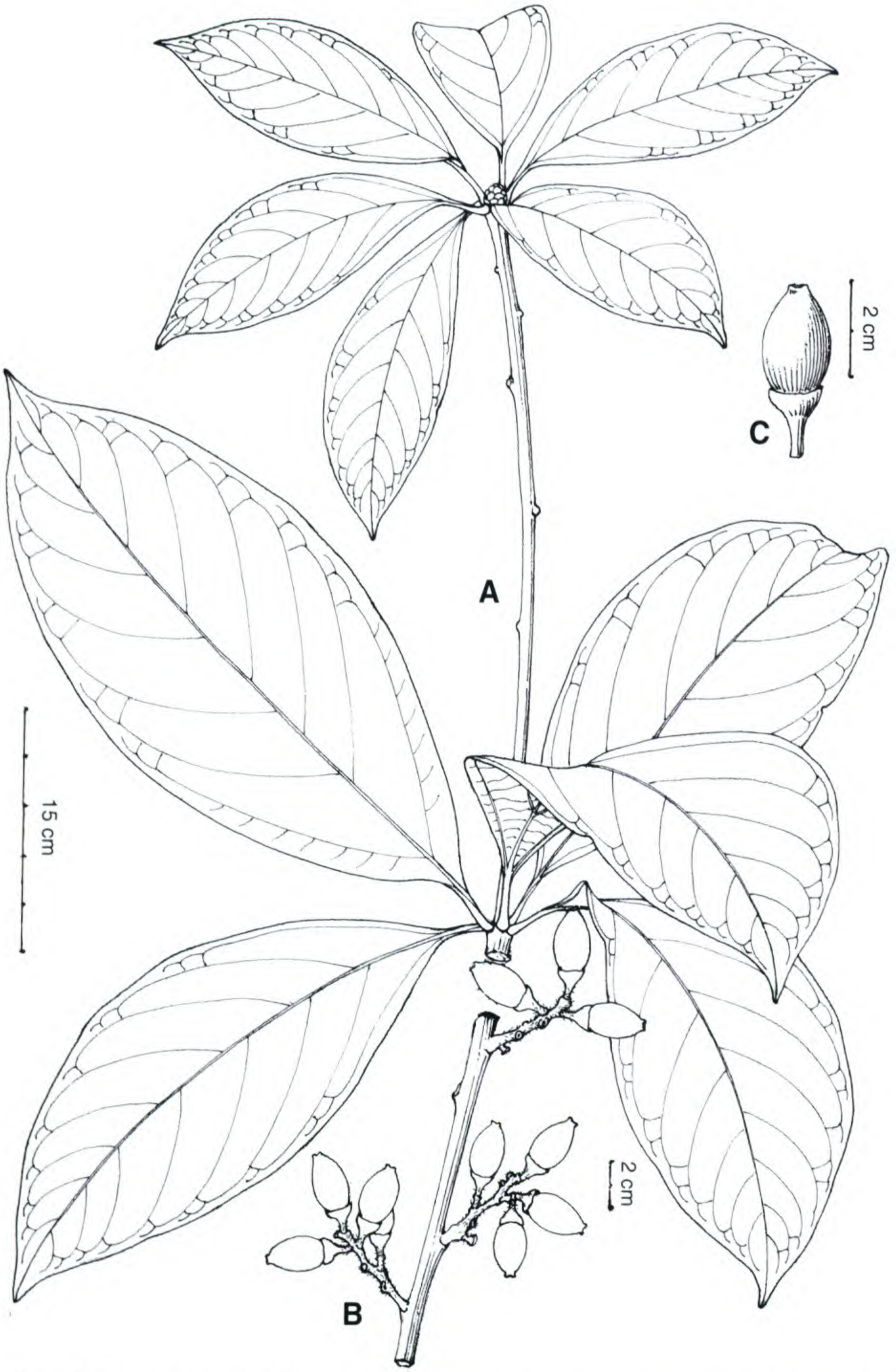

Figure 1. *Actinodaphne menghaiensis* J. Li, sp. nov. —A. Vegetative branch, with leaves. —B. A portion of the branch with three infructescences. —C. Fruit. Drawn from the type specimen, *Y. H. Li 3603* by Xi-lin Wu.

species *Actinodaphne menghaiensis* from South Yunnan, as defined here, has a totally different floristic origin from *A. obovata*, which is from Northeast India, Southeast Tibet, and Southeast Yunnan.

At present, *Actinodaphne menghaiensis* is known only from the type collection in Menghai, Yunnan, China. It resembles closely *A. obovata* and differs from the latter in having glabrous buds, branchlets,

and leaves, smaller fruits (up to 2.5 × 1.5 cm), as well as slender fruit pedicels (up to 1 cm long and 2 mm diam.).

Litsea martabanica (Kurz) Hooker f., Fl. Brit. India 5: 164. 1886. *Tetranthera martabanica* Kurz, For. Fl. 2: 301. 1877. TYPE: Burma. Tenasserim & Martaban, in the drier hill forest, 4000–6000 ft., *Kurz* (holotype, K).

Litsea garrettii Gamble, in Kew Bull. 204. 1913. Syn. nov. TYPE: [Thailand.] Siam, *H. B. G. Garrett 63* (lectotype, designated here, K).

In 1972, Kostermans determined Edinburgh's specimens of *Litsea garrettii* collected from Yunnan, China, Myanmar, and Thailand as *L. martabanica*, considering that the former was a synonym of the latter. A study of the available collections of *L. garrettii* in K and KUN, including the syntypes, shows that this species has all the characters of *L. martabanica*, especially for the foliage indumentum and racemiform pseudo-umbels. We agree with Kostermans's treatment and regret that he did not publish his opinion during his life, and therefore publish the new synonymy here.

Litsea martabanica is distributed in Thailand, Myanmar, and South to Southwest Yunnan, China, 550–2500 m. It is more or less sympatric, overlapping in its range with *L. semecarpifolia* listed below. Such a distribution pattern shows that there is a close floristic relationship between Myanmar and South Yunnan, China, which may be the result of the northward movement of the Burma-Malaya plate (Audley-Charles, 1987).

H. B. G. Garrett 63 (K) is designated as a lectotype of *Litsea garrettii* Gamble for it is the only collection with staminate flowers among syntypes and the epithet is named after the collector.

Additional specimens examined (all specimens at KUN). CHINA. **Yunnan:** Menghai, *C. W. Wang 73484, H. T. Tsai 5910403, K. M. Feng 14240, Sino-Russ. Exped. 003, P. Y. Chiu 56449, Y. H. Li 3628, P. I. Mao 7141*; Jinghong, *C. W. Wang 75500, K. M. Feng 14478*; Mengla, *H. T. Tsai 59–11094, C. J. Pei 59–9481, Y. H. Li 1098, W. T. Wang 10390*; Jingdong, *M. K. Li 561, C. Y. Wu 209, S. G. Xu 3407, S. Y. Bao 366*; Simao, *Chinese Forest Inst. L01488, P. I. Mao 5790*; Menglian, *Menglian Exped. 9580*; Lincang, *T. P. Zhu 009, J. S. Xing 366*; Gengma, *T. P. Zhu 312, Y. H. Li 2108, S. T. Li 805*; Cangyuan, *Y. H. Li 11843*; Shuangjinag, *J. S. Xing 941*; Longling, *H. T. Tsai 55790*; Luxi, *C. Chen 452, R. L. Xiong 580155*; Ruili, *S. Chow 528*; Longchuan, *G. D. Tao 13565*; Fugong, *H. T. Tsai 58903.*

Litsea mollis Hemsley, in J. Linn. Soc. Bot. 26: 383. 1891, non *L. mollis* (Blume) Boerlage, in Handl. Fl. Ned. Ind. 3: 141. 1900. TYPE: China. Hupeh, *A. Henry 3177* (lectotype, designated here, K).

L. euosma W. W. Smith, in Notes Bot. Gard. Edinburgh 13: 166. 1921. Syn. nov. TYPE: China. Yunnan, *G. Forrest 9333* (lectotype, designated here, E).

On the basis of the descriptions, the differences between *Litsea euosma* and *L. mollis* are as follows: the former is characterized by ovate to elliptic leaves, acuminate apex, round base, sparse indumentum on lower surface, and 4 fasciculate pseudo-umbels; the latter by oblong leaves, acute apex, cuneate base, dense indumentum on lower surface, and 2 or 3 fasciculate pseudo-umbels. After checking the syntypes in K and E as well as a large number of collections in KUN, we consider that the differences are too overlapping to distinguish them. Traditionally, the specimens at KUN from tropical areas are determined as *L. euosma*, those from subtropical as *L. mollis*. After a careful study of these two species, we consider they are the same; the diagnostic characters for *L. euosma* fall in the range of *L. mollis*, and hence the new synonymy is proposed. *Litsea mollis* is distributed in South to Southwest China and North Vietnam, 200–2700 m.

A. Henry 3177 (K) is designated as the lectotype of *Litsea mollis* Hemsley, for it is the more complete collection among the three syntypes seen by the authors. *G. Forrest 9333* (E) is designated as the lectotype of *L. euosma* W. W. Smith, for it is mentioned first by the describing author.

Additional specimens examined (all at KUN). CHINA. **Yunnan:** Jinping, *K C. Wang 3, H. Q. Sha 101, J. X. Zhang 177, Y. C. Hsu 282, Sino-Russ. Exped. 1873*; Pingbian, *P. I. Mao 3478, Sino-Russ. Exped. 4495, K. M. Feng 4848*; Xichou, *S. Z. Wang 414, C. W. Wang 85969, C. A. Wu 7273*; Hekou, *K. H. Cai 998, K. M. Feng 21722*; Mengla, *Y. H. Li 771, C. J. Pei 59–9481*; Jingdong, *C. A. Wu 9106, P. Y. Chiu 53020, M. K. Li 3022, X. F. Deng 044*; Shuangjiang, *J. S. Xing 1046*; Cangyuan, *Y. H. Li 12232*; Longling, *H. T. Tsai 56672, C. Chen 619*; Tengchong, *C. Chen 301, W. C. Yin 60–1228, R. L. Xiong 580950*; Luxi, *R. L. Xiong 580241*; Lianghe, *R. L. Xiong 580861*; Fugong, *H. T. Tsai 54981*; Gongshan, *Q. Lin 790853, K. M. Feng 24240*; Yangbi, *Sino-Amer. Exped. 520.* **Guangxi:** Rongshui, *S. H. Chen 16688, T. C. Chen 797*; Longzhou, *S. H. Chen, 12845.* **Guangdong:** Ruyuan, *L. Teng 44158*; Lianxian, *P. C. Tam 60118*; Yangshan, *P. C. Tam 60290.* **Jiangxi:** Anfu, *J. S. Yue 3057*; Xunwu, *C. M. Hu 1249*; Suichuan, *S. K. Lai et al. 5523.* **Hunan:** Ningyuan, *P. C. Tsong 908*; Xinning, *L. H. Liu 15044.* **Zhejiang:** Taishun, *S. Y. Zhang 5543.* VIETNAM. **Vinhphu:** *Sino-Viet. Exped. 2041.*

Litsea salicifolia (Nees) Hooker f., Fl. Brit. India 5: 167. 1886. *Tetranthera salicifolia* Nees, Pl. Asiat. Rar. 2: 66. 1831. TYPE: Himalayas, *Wallich 2536* (lectotype, designated by J. D. Hooker, 1886: 167, K).

Litsea atrata S. Lee, in Acta Phytotax. Sin. 8(3): 195. 1963. Syn. nov. TYPE: China. Hainan: Po-ting Hisen, *F. C. How 72739* (holotype, IBSC).

Litsea salicifolia, as accepted here, has wide distribution and large morphological variation, just as Hooker (1886: 168) stated "leaves very variable, pale brown or darker above when dry, smooth and usually obscurely reticulated above, nerves beneath strong with faint nervules." Characters for *Litsea atrata* (Lee, 1963) are just in the range of *L. salicifolia*, especially for *L. salicifolia* var. *laurifolia* Hooker f.; the differences in leaf shape and color are rather subtle. We decided to accept this species in its broad sense and conclude that the two species are the same; therefore the new synonymy is proposed. *Litsea salicifolia* is distributed in India, Nepal, Sikkim, Bangladesh, Myanmar, South China, and North Vietnam, 200–1200 m.

Additional specimens examined (all at KUN). CHINA. **Yunnan:** Pingbian, *H. T. Tsai 61373, P. I. Mao 3972, Sino-Russ. Exped. 3678*; Jinping, *Sino-Russ. Exped. 2554, Luchun Exped. 1025*; Luchun, *Luchun Exped. 288*; Funing, *C. W. Wang 89685*; Malipo, *S. Z. Wang 818*; Jinghong, *Sino-Russ. Exped. 9803*; Mengla, *Y. H. Li 18644*; Cangyuan, *Y. H. Li 11673*. **Guizhou:** Luodian, *S Guizhou Exped. 774*; Anlong, *Anshun Exped. 88*; Xingyi, *Z. S. Zhang 6144*. **Guangxi:** Longzhou, *S. H. Chen 11629*; Fusui, *S. H. Chen 12157*; Bose, *Z. T. Li 601024*. VIETNAM. **Ninhbinh:** *Sino-Viet. Exped. 2363*.

Litsea semecarpifolia (Nees) Hooker f., Fl. Brit. India 5: 165. 1886. *Tetranthera semecarpifolia* Nees, Pl. Asiat. Rar. 3: 31. 1832. TYPE: Burma. *Wallich 6345B* (lectotype designated by J. D. Hooker, 1886: 165, K).

L. magnoliifolia Yang & P. H. Huang, in Acta Phytotax. Sin. 16(4): 52, pl. 3, f. 2. 1978. Syn. nov. TYPE: China. Gengma, *Yunnan Univ. Exped. 302* (holotype, YUKU).

After comparison of the specimens from Myanmar with those from China, there is no doubt that the two species are the same, and hence the new synonym is made. *Litsea semecarpifolia*, as accepted here, is distinguished by its elliptic leaves (11–20 × 5–10 cm), with obtuse apex and cuneate base; its racemiform pseudo-umbels on axillary shortened branchlets; perianth segments 8; 12 to 14 fertile stamens; and cup-shaped cupules. Six perianth segments are typically seen in *Litsea*. The presence of eight perianth segments in *Litsea semecarpifolia* is unusual within the genus. Four perianth segments have been reported in *L. khasyana* by Meissner (in DC. Prodr. XV. 1: 185. 1864); with no perianth segments seen in *L. glutinosa* by J. D. Hooker (in Fl. Brit. Ind. 5: 157. 1886). *Litsea semecarpifolia* is distributed in South to Southwest Yunnan, China, Myanmar, and East Bangladesh, 740–1400 m.

Additional specimens examined. CHINA. **Yunnan:** Gengma, *Y. H. Li 2133* (KUN); Jinghong, *C. W. Wang 79156* (KUN), *Chinese Forest Inst. Exped. L01614* (KUN). MYANMAR. Maymyo, Bhamo, Subonchaung to Kunbaung, *J. H. Lace 5285* (E); *C. Gilbert Rogers 667* (E).

Acknowledgments. We thank the curators of E, IBSC, K, KUN, and YUKU for their kind help and Xi-lin Wu for his skillful drawing. Thanks are also due to Jens Rohwer and Henk van der Werff for their helpful comments. Jie Li acknowledges grant support from YNSF (2001C0008R), CASTALENTS (20010713093959), and CEF (498) in China

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A New Species of *Triaenophora* (Scrophulariaceae) from China

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ABSTRACT. A new species of *Triaenophora* Solereder, *T. shennongjiaensis* X. D. Li, Y. Y. Zan & J. Q. Li (Scrophulariaceae), is described and illustrated from Shennongjia National Natural Reserve, Hubei Province, China. The new species is related to *T. rupestris* (Hemsley) Solereder, from which it differs in having densely glandular leaves, dentate bract margins, and pale yellow petals that are retuse or rarely obtuse at their apices.

Key words: China, Scrophulariaceae, *Triaenophora*.

Triaenophora Solereder (Scrophulariaceae) was separated from the genus *Rehmannia* Liboschitz ex Fischer & C. A. Meyer, on the basis of its three-lobed calyx (Solereder, 1909). *Triaenophora* is distributed in western and northwestern Hubei and Chongqin in China, with only two species, *T. rupestris* (Hemsley) Solereder in Hubei and *T. integra* (Li) Ivanina in Chongqin (Forbes & Hemsley, 1890; Li, 1948; Ivanina, 1955; Chin, 1979). These two species are similar in general appearance, but the latter species has smaller leaves, which are rounded at the tip and entire instead of acute and serrate.

The new species was collected from the Panlong cavern, Shennongjia National Natural Reserve, Hubei, China. It appears most closely related to *T. rupestris* (Hemsley) Solereder, but differs from it in having densely glandular leaves, dentate bract margins, and pale yellow petals that are retuse or rarely obtuse apically.

Triaenophora shennongjiaensis X. D. Li, Y. Y. Zan & J. Q. Li, sp. nov. TYPE: China. Hubei: Shennongjia Nat. Nat. Res., Panlong cavern, 110º27′58″E, 31º24′41″N, 8 Aug. 2003, *Yanyan Zan 238* (holotype, HIB). Figure 1.

Species *T. rupestri* Solereder affinis, sed foliis utrinque dense glandulosis vel laxe pilosis, bracteis margine dentatis, corollas luteolis, apice retusis vel raro rotundatis differt.

Perennial herbs, 10–60 cm tall, leaves and stems with sparse non-glandular and dense glandular hairs; roots pale yellow, fleshy, brittle; stem very short; leaves in a basal rosette, oblong to elliptic, 8–20 × 5–10 cm, densely glandular or pilose on both surfaces, base subcordate to cuneate, margins dentate, apex obtuse; petioles 3–6 cm long. Inflorescence racemose, main raceme suberect, lateral racemes prostrate, bracts in lower parts resembling basal leaves, 20–50 cm long, compact, 12- to 54-flowered; bracts similar to leaves but smaller, oblong, margins dentate; pedicels 5–25 mm long; bracteoles 2 at middle of pedicels, linear, opposite, 3–20 mm long. Flower with calyx cylindrical, tube 5–8 mm long, erect, 5-lobed with each lobe 3-toothed, the teeth linear, irregularly acuminate, 6–12 mm long; corolla pale yellow, 4–6.5 cm long, pilose abaxially, glabrous adaxially, corolla tube elongate, erect or slightly curved, 3–4.5 cm long, 1–1.5 cm diam., often with purplish red spots and glands within the throat, corolla 2-lipped, lobes with apices obtuse or rarely retuse, superior lobe separated by deeper sinuses, narrower, 2-toothed, 8–15 × 6–10 mm, inferior lobes 3-toothed, 8–15 × 4–8 mm; stamens 4, included, anthers 2–3 mm long; ovary ovoid, glabrous, ca. 3.5 cm long, styles included, stigma bifid. Capsules oblong, 8–15 × 8 mm; seeds numerous, minute, ca. 1 × 0.5 mm, oblong, laevigate.

Distribution. China, Hubei Province, Shennongjia National Natural Reserve and elsewhere, including Badong and Xingshan counties (see paratypes); 700 to 1200 m. The distribution of this new species indicates that it is rare. Only 6 populations containing a total of about 600 to 700 individuals were found in Shennongjia and neighboring mountains. The type population consists of only about 100 individuals in nearly inaccessible sites on the limestone cliff near Panlong cavern. *Triaenophora shennongjiaensis* is an endangered species that is

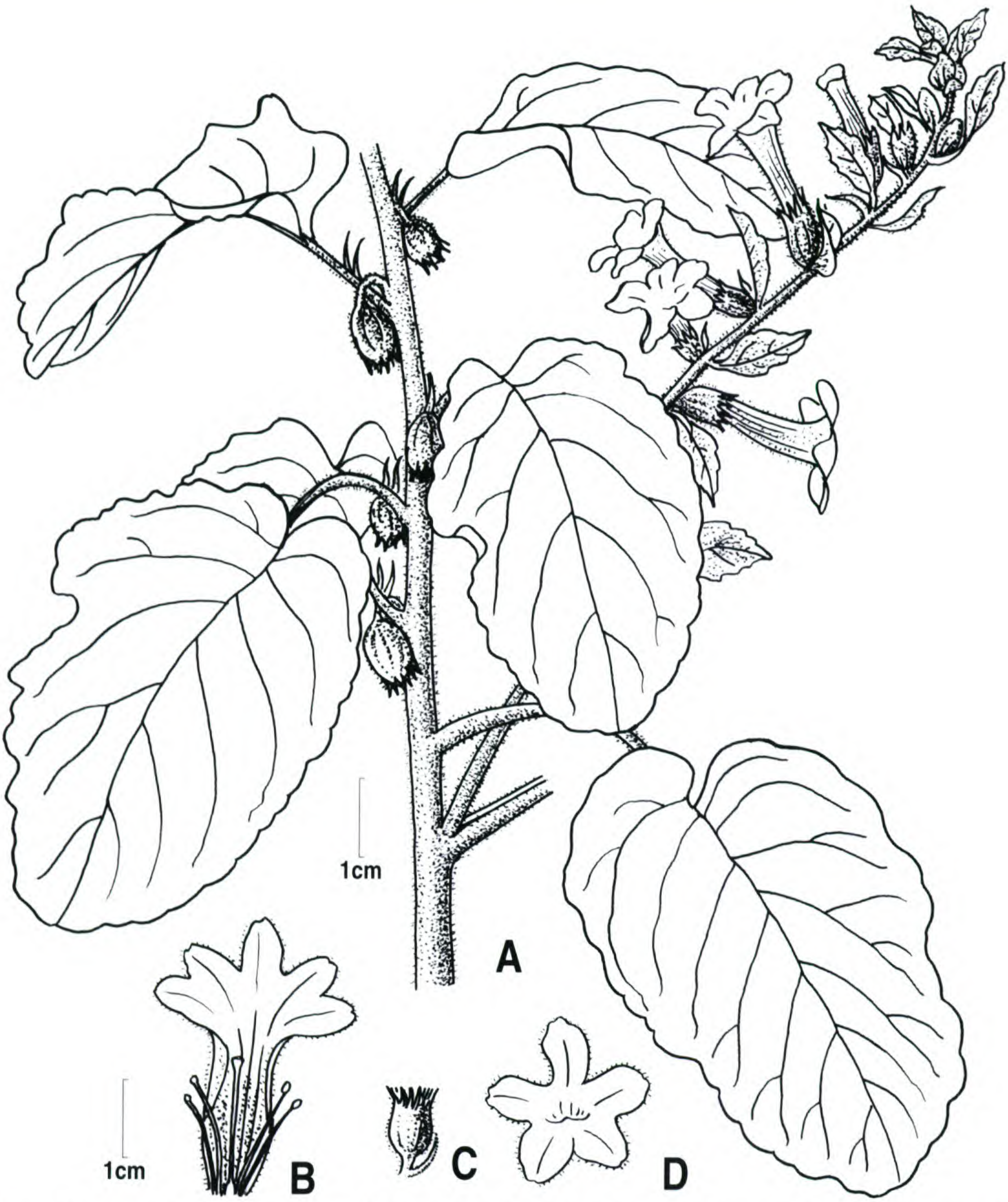

Figure 1. *Triaenophora shennongjiaensis* X. D. Li, Y. Y. Zan & J. Q. Li. —A. Habit. —B. Longitudinal section of flower. —C. Calyx, showing teeth. —D. Corolla. Drawn by G. X. Chen.

endemic to the limestone habitats. Intensive searches to locate additional native populations as well as strict conservation measures to safeguard the known populations are urgently needed. *Triaenophora shennongjiaensis* and *T. rupestris* have allopatric distributions: the former in Shennongjia National Natural Reserve, Badong, Xingshan, and Baokang; and the latter in Lichuan, Zhuxi, and Fang counties of Hubei and Wuxi, Wulong, Wushan, and Chengkou counties of Chongqin.

Phenology. Flowering late June to mid October.

Both species have been cultivated in Wuhan Botanical Garden for one year, from July 2003 to July 2004. *Triaenophora shennongjiaensis* flowers in early May, whereas *T. rupestris* flowers in mid June.

The diagnostic characters of both species, namely, the morphology of the bracts, the floral morphology, the color of the petals, and the pubescence, are basically stable and show no differences between cultivated and native specimens.

Paratypes. CHINA. **Hubei:** Badong County, Yutougou village, 20 Aug. 2003, *Xiaodong Li 0122* (HIB); Baokang County, 38.5 km along road from Maqiao to Xiema, 31 July 2003, *Xiaodong Li 0138* (HIB); 12 Aug. 2004, *Xiaodong Li 0158* (HIB); Xingshan County, Xiangping village, 16 July 2003, *Xiaodong Li 0131* (HIB).

Key to the Species of *Triaenophora*

1a. Leaves bigger, tip acute, and margin serrate.
  2a. Bract margins entire; corolla purple-red, apices obtuse . . . . . 1. *T. rupestris*
  2b. Bract margins dentate; corolla pale yellow, apices retuse or rarely obtuse . . . . . 2. *T. shennongjiaensis*
1b. Leaves relatively smaller, tip rounded, and margin entire . . . . . 3. *T. integra*

Acknowledgments. The project was supported by the Chinese Academy of Sciences and Wuhan Botanical Garden, CAS (KSCX2-SW-104, 05035123, 01035123).

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Three New Species of Vitaceae from Mesoamerica

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ABSTRACT. Three new species, *Cissus nicaraguensis*, *C. patellicalyx*, and *Ampelocissus mesoamericana*, are described from Nicaragua, Costa Rica, and El Salvador, respectively. *Cissus nicaraguensis* can be distinguished from all other Neotropical species by the combination of urceolate calyx and simple leaves. *Cissus patellicalyx* is recognized by its subspherical floral buds, immature fruits minutely tuberculate when dried, and the distinctly raised nerves of the abaxial leaf surface. *Ampelocissus mesoamericana* is characterized by lenticels, indument, and the obpyriform flower buds.

RESUMEN. Se describen tres nuevas especies, *Cissus nicaraguensis*, *C. patellicalyx* y *Ampelocissus mesoamericana*, de Nicaragua, Costa Rica y El Salvador, respectivamente. *Cissus nicaraguensis* puede distinguirse de todas las otras especies neotropicales por la combinación de un cáliz urceolado y las hojas simples. *Cissus patellicalyx* se reconoce por los botones florales subesféricos, los frutos inmaduros diminutamente tuberculados cuando secos y los nervios distintamente prominentes en el lado abaxial de las hojas. *Ampelocissus mesoamericana* se caracteriza por las lenticelas y el indumento, y los botones florales obpiriformes.

Key words: *Ampelocissus*, *Cissus*, Mesoamerica, Vitaceae.

Cissus is the largest genus of Vitaceae with perhaps 350 species in the entire world (Mabberley, 1987), while *Ampelocissus* is much smaller, with ca. 95 species in Africa, Asia, and America (Mexico, south through Mesoamerica and the Caribbean) (Lombardi, 2000). I revised the family, excluding *Vitis*, in the Neotropics to include 80 species: *Cissus* (75), *Ampelocissus* (4), and *Ampelopsis* (1) (Lombardi, 2000). Since then, two new species have been described (Lombardi, 2002, 2004) and another from South America is under description (Hamilton Beltram, pers. comm.).

While working on the Vitaceae for the *Flora Mesoamericana* I found the following three new species: *Cissus nicaraguensis*, *C. patellicalyx*, and *Ampelocissus mesoamericana*.

Cissus nicaraguensis is from Honduras and Nicaragua, similar and perhaps close to the simple-leaved and red-flowered species-group including *Cissus biformifolia* Standley and *C. gossypiifolia* Standley. *Cissus patellicalyx* is noted for its subspherical flower buds, unique among the Mesoamerican species, the minutely tuberculate dried fruit, and the raised nerves on the abaxial side of leaves. *Ampelocissus mesoamericana*, which is very similar to *Ampelocissus erdvendbergiana* J. E. Planchon, was overlooked in my monograph (Lombardi, 2000), but is distinguished by its lenticels and the obpyriform flower buds.

Cissus nicaraguensis Lombardi, sp. nov. TYPE: Nicaragua. Matagalpa: Ranchería, 11 km NE de Muy Muy, 12°46′N, 85°31′W, ca. 280 m, 20–22 Aug. 1984 (fl), *P. P. Moreno 24466* (holotype, MO; isotype, HNMN not seen). Figure 1.

Liana, inter species neotropicales combinatione foliis simplicibus et calyce urceolato singularis. Haec species *C. biformifoliae* et *C. gossypiifoliae* similis sed calyce urceolato lateraliter tuberculato, cirrhis non ramosis squamis destitutis, alabastris ampulliformibus et inflorescentiis minoribus differt.

Liana; the trichomes malpighiaceous, silvery; branches terete, striated, sericeous and glabrescent or glabrous; *tendrils* unbranched, flattened, devoid of scales. *Stipules* 2–4 mm, oblong, the base sagittate or cordate, persistent; *leaves* simple, drying brown; petioles (1.5–)3–4.2(–6.3) cm long, cylindrical, blades (7.9–)12–14(–18) × (2.5–)4–6.6(–9.3) cm, triangular on vegetative branches, elliptic or rarely subtriangular on reproductive branches, base reniform to truncate on vegetative branches, cuneate or rarely reniform on reproductive branches, apex acuminate, margin denticulate, papery, sparse sericeous in both sides chiefly along nerves and glabrescent, or glabrous, spiculate on the abaxial side. *Inflorescences* compound cymes, 1–1.9 × 1–2.1 cm, flat-topped; peduncle 0.4–0.8 cm long, sericeous and glabrescent or glabrous; bracts 0.5–1 mm long, triangulate, glabrous, the base of proximal ones sagittate; pedicels (0.8–)1.5–2 mm long, sericeous and glabrescent or glabrous. *Flower*

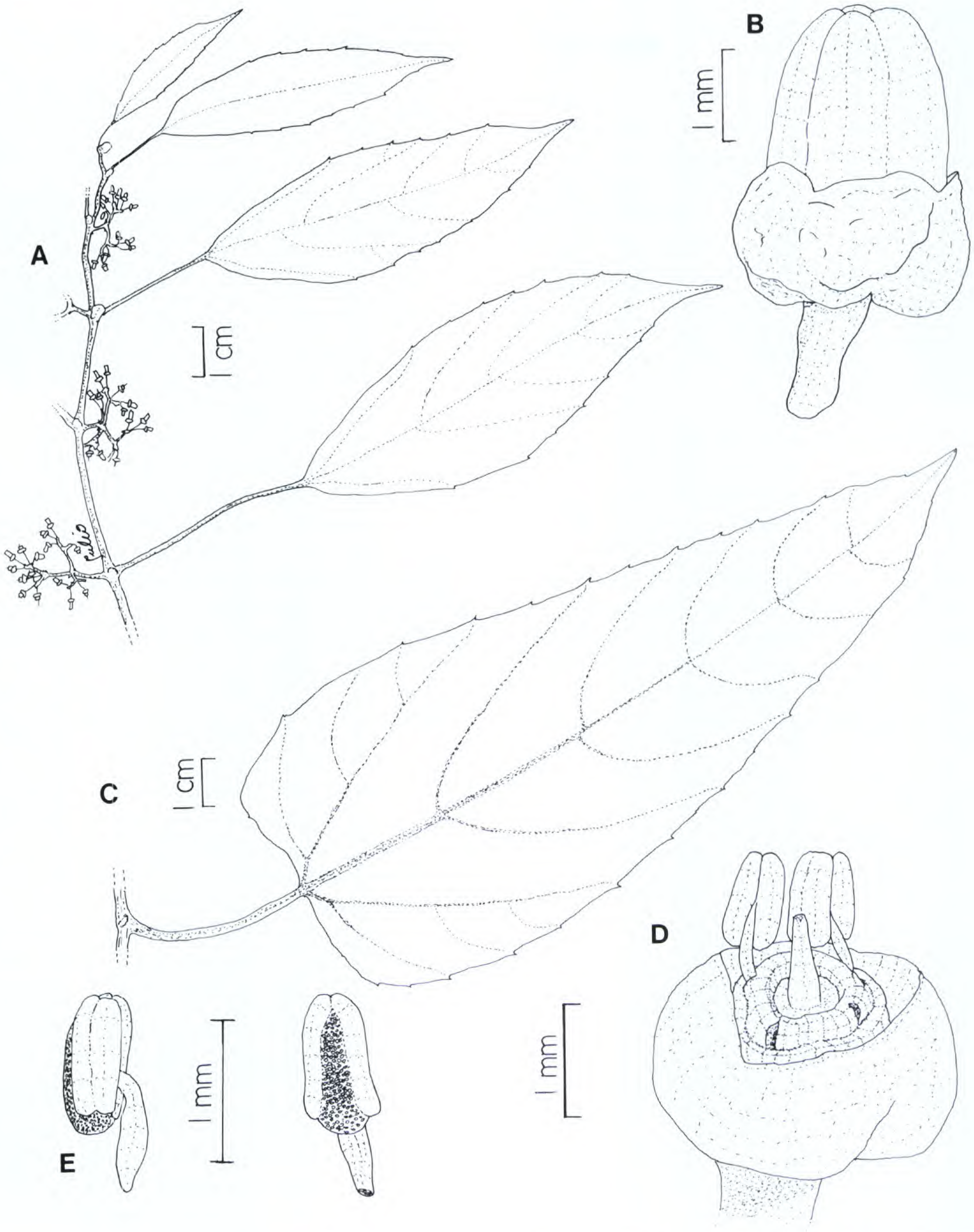

Figure 1. *Cissus nicaraguensis*.—A. Reproductive branch with leaves and inflorescences. —B. Lateral view of flower bud. —C. Leaf of vegetative branch. —D. Lateral view of disc, stamens and style, the petals and two stamens removed. —E. Lateral (left) and abaxial (right) view of stamens. (A, C from the holotype *Moreno 24466*, MO; B, D, E from *Chorley 178*, MO). Drawn by the author.

buds flask-shaped, red; calyx 1.1–1.4 × 2–2.5 mm, cotyliform, fleshy, glabrous or sparse sericeous on the base and glabrescent, lobes deltate and undulate, urceolate, laterally tuberculate, base truncate; corolla in bud 1.9–2.1 × 1.5–1.7 mm, slightly 4-angled in section, petals coherent, caducous after anthesis, glabrous; stamens 4, 1–1.5 mm long, filament 0.5–0.8 mm long, the connective lanceolate, granular, drying yellow, the anther 0.5–1 × 0.5 mm, ovate, latrorsely dehiscent; disc 1 mm diam., minutely tubular, covering the apex of ovary; style ca. 1 mm long after anthesis, terete; stigma punctate, obscurely papillose. *Fruit* and seed unknown.

Distribution and ecology. *Cissus nicaraguensis* is known only from Nicaragua and Honduras, at altitudes of 280–600 m. Flowering in August and September.

Cissus nicaraguensis resembles *C. biformifolia* and *C. gossypiifolia*, both from Mexico, Mesoamerica, and northwestern South America, by the blade shape (in *C. gossypiifolia* the leaves on the reproductive shoots only), the red flowers, and the minutely tubular disc (only in *C. biformifolia*). The new species is distinguished easily by the urceolate calyx laterally tuberculate (vs. not urceolate and not tuberculate calyx of the other two species), the unbranched tendrils devoid of scales (vs. branched with subtending triangular scales), the flask-shaped flower buds (vs. conical in *C. biformifolia* and ellipsoid in *C. gossypiifolia*), the corolla in bud slightly 4-angled in section (vs. circular), and the smaller inflorescences (1–1.9 × 1–2.1 cm vs. (1.8)3.5–4.6(6.2) × (1.8)2.3–3.4(5.5) cm).

The urceolate calyx combined with the simple leaves of this species is unique among the known Neotropical species, all other species with urceolate calyces featuring (3-foliolate) leaves.

Paratypes. HONDURAS. **Olancho:** Catacamas, outskirts of town, roadside vine on tall planted nettle hedge, 11 Sep. 1991, *M. Chorley 178* (BM not seen, MO). NICARAGUA. **Matagalpa:** Ranchería, 11 km NE de Muy Muy, 20–22 Aug. 1984, *P. P. Moreno 24424* (HNMN not seen, MO). **Nueva Segovia:** El Jícaro, 7 km NE del Jícaro, valle Casas Viejas, 2 Aug. 1980, *P. P. Moreno 1680* (HNMN not seen, MEXU, MO).

Cissus patellicalyx Lombardi, sp. nov. TYPE: Costa Rica. Cartago: Parque Nac. Tapanti, along road from main gate to hydroelectric plant, 3–4 km from main gate, 09°45′20″N, 83°47′00″W, 1250–1350 m, 7 Sep. 1996 (fl, young fr), *T. B. Croat 79030* (holotype, MO [1 of 2; 2 of 2]; isotypes, BHCB, BM not seen, EAP not seen, INB not seen, MEXU not seen, PMA not seen). Figure 2.

Liana, inter species Mesoamericanas alabastris subsphaericis et calyce patelliformi singulis. Haec species *C. verticillatae* et *C. tiliaceae* affinis sed trichomatibus malpighiaceis, nervis distincte prominentibus foliorum abaxiali superficie, calyce patelliformi, alabastris subsphaericis et fructibus lenticellatis minute tuberculatis (in sicco) facile distincta.

Liana; the trichomes malpighiaceous, silvery; branches terete, lenticellate, sericeous and glabrescent; *tendrils* not seen. *Stipules* 2–4 mm, deltate, the margin scarious, persistent; *leaves* simple, drying green with cream-colored nerves on the abaxial side; petioles (0.9–)3(–5.6) cm long, canaliculate, blades (6.9–)12(–15.5) × (4.3–)7.7(–11.2) cm, oblong, subtriangular or rhombic, slightly asymmetric, base truncate to reniform, apex acuminate, margin denticulate, papery, sparsely sericeous on both sides, chiefly along veins on the abaxial side and on the blade base, glabrescent, veins very prominently raised on the abaxial side, secondary veins forming domatia at the junction with primary vein. *Inflorescences* compound cymes, 1.5–4.5 × 1.5–2.5 cm, flat-topped; peduncle 0.8–2.8 cm long, sparsely sericeous, chiefly in the extremities, glabrescent; bracts 0.3–1 mm long, triangulate, glabrous; pedicels 2–3 mm long, glabrous. *Flower* buds subspherical, green; calyx 1.4–1.6 mm diam., patelliform, papery, glabrous, truncate, base rounded; corolla in bud 1.4–1.6 × 1.6–1.7 mm, slightly enlarged on middle section, petals coherent, caducous after anthesis, glabrous; stamens 4, 1.5 mm long, filament 1.1 mm long, the connective deltate, granular, drying yellow-brown, the anther 0.5 × 0.5 mm, deltate, latrorsely dehiscent; disc 1.5 mm diam., not covering the apex of ovary, margin minutely raised, irregular; style ca. 0.6 mm long before anthesis, terete; stigma punctate, obscurely convex. *Immature berry* 6 × 6 mm, subspherical, green, lenticellate, drying minutely tuberculate; seed 1, 6 × 4 mm, subturbinate, transversely ribbed.

Distribution and ecology. *Cissus patellicalyx* is known only by two collections from Costa Rica, where it occurs in forest, at altitudes of 1250–1400 m. Flowering and fruiting in August and September.

Cissus patellicalyx superficially resembles *C. tiliacea* Kunth and *C. verticillata* (L.) D. H. Nicolson & C. E. Jarvis by its leaves and green flowers, but is easily distinguished by the patelliform calyx (vs. cotyliform), subspherical flower buds (vs. ellipsoid), malpighiaceous trichomes (vs. unbranched), lenticellate immature fruits drying tuberculate (vs. smooth, not lenticellate), and by the prominently raised nerves on the abaxial side of blades (vs. not particularly prominent nerves).

I have encountered subspherical buds among the

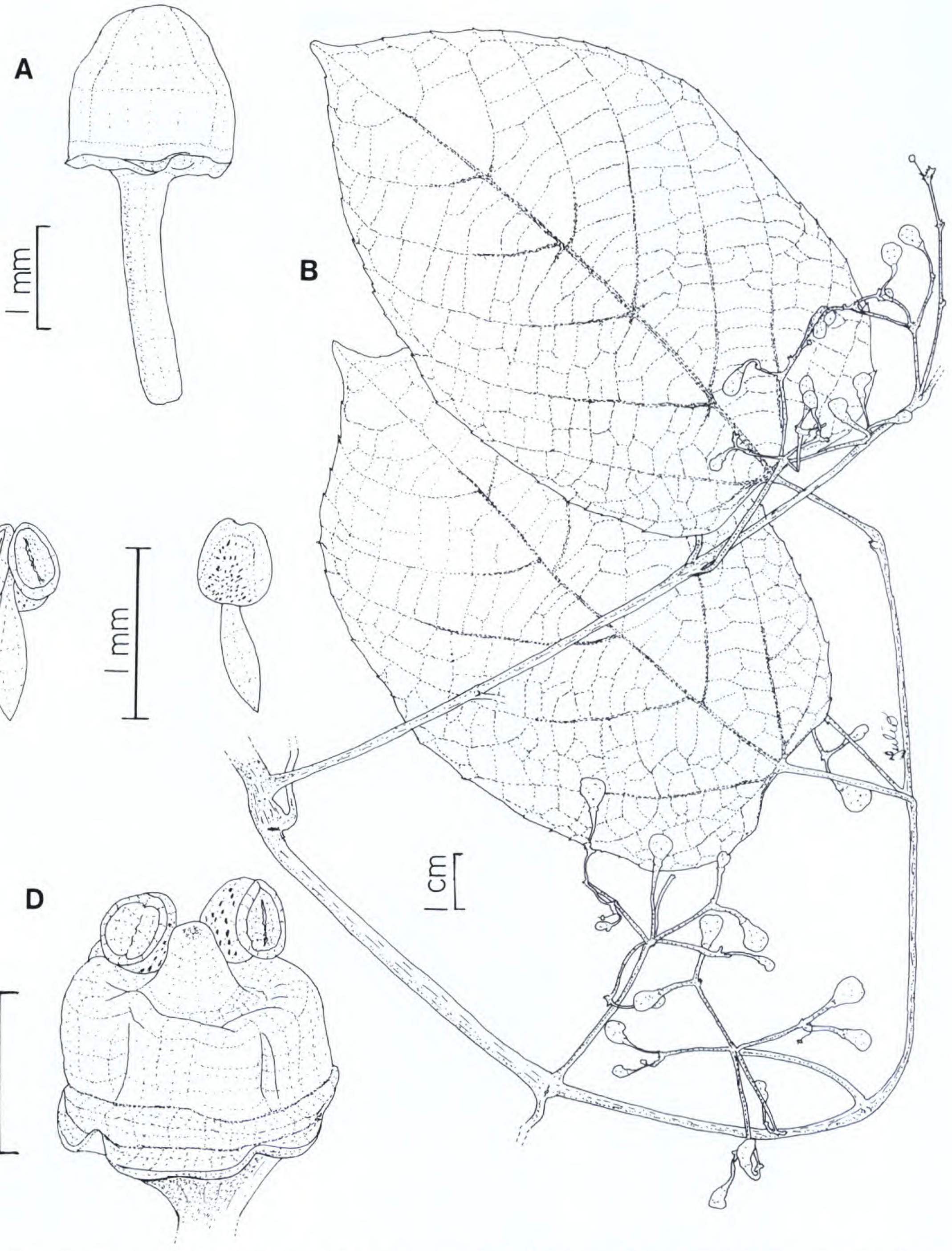

Figure 2. *Cissus patellicalyx.*—A. Lateral view of flower bud. —B. Reproductive branch with leaves and inflorescences. —C. Adaxial (left) and abaxial (right) view of stamens. —D. Lateral view of disc, stamens and style, the petals and two stamens removed. (A–D from the isotype *Croat 79030*, BHCB). Drawn by the author.

Neotropical species only in *Cissus inundata* (J. G. Baker) J. E. Planchon, an endemic of rocky grasslands ("campos rupestres") from northern Minas Gerais in Brazil. The patelliform calyx is also unique among the other *Cissus* species from the Neotropics; only the calyx of the species of *Ampelocissus*, *Ampelopsis*, and *Vitis* can be described as patelliform.

The collections perhaps suggest this is a rare species with a restricted distribution; fortunately

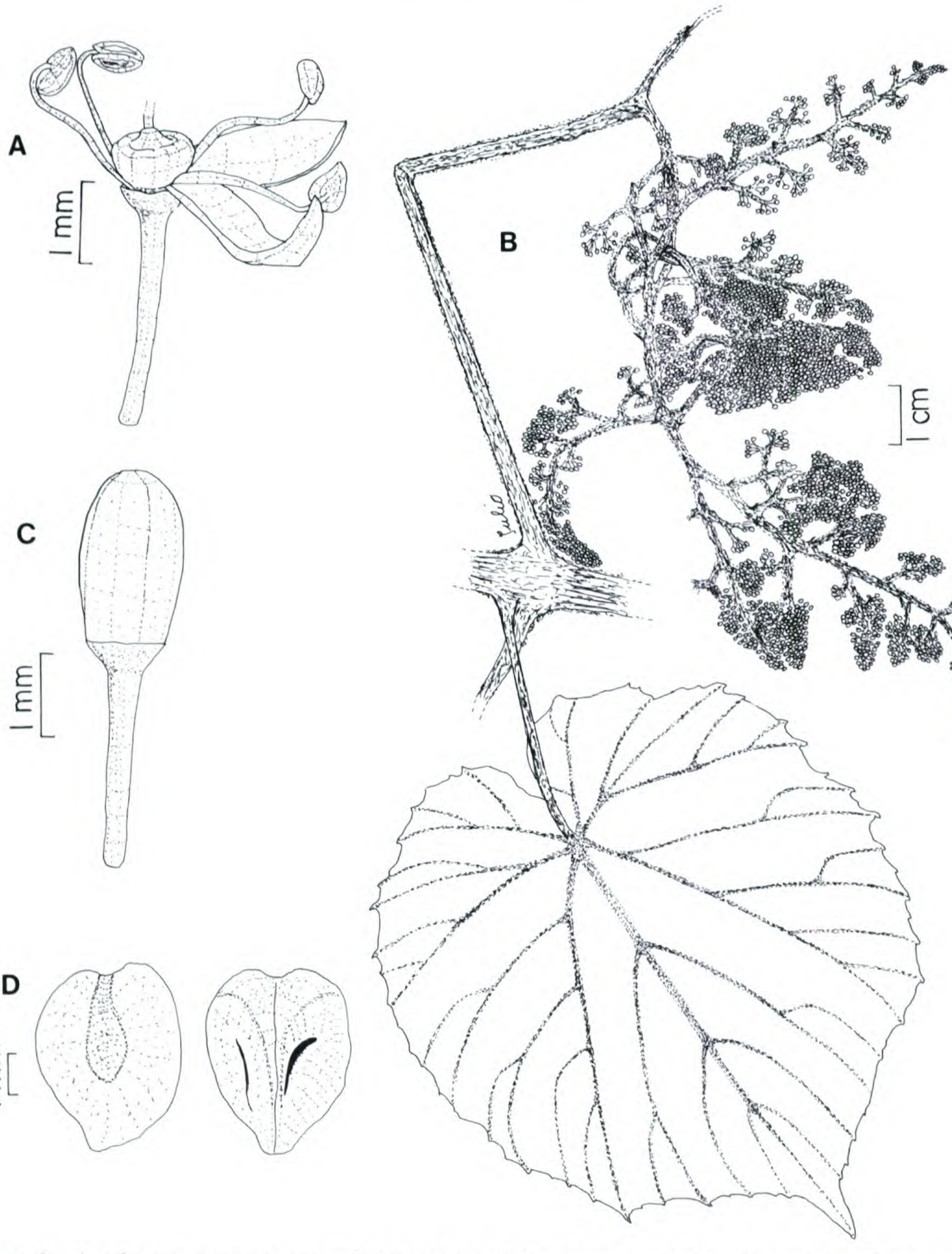

Figure 3. *Ampelocissus mesoamericana*.—A. Lateral view of disc, stamens and style, three petals and one stamen removed. —B. Reproductive branch with vegetative branch leaf. —C. Lateral view of flower bud. —D. abaxial (left) and adaxial (right) view of seeds. (A–C from the holotype *Tucker 905*, US; D from *Ton 2444*, F). Drawn by the author.

the specimens were collected inside a protected area, the P. N. Chirripó, in Costa Rica.

Paratype. COSTA RICA. **San José:** Cantón de Pérez Zeledón, P. N. Chirripó, Cuenca Térraba-Sierpe, Sendero El Llano, 6 Aug. 1997, *E. Alfaro 1226* (INB not seen, MO).

Ampelocissus mesoamericana Lombardi, sp. nov. TYPE: El Salvador. San Miguel: ca. 200 m W of Hacienda Potrero Santo, S side of Lake Olomega, 13º17′N, 88º05′W, ca. 60 m, 5 Feb. 1942 (fl), *J. M. Tucker 905* (holotype, US; isotype, UC not seen). Figure 3.

Liana bisexualis, *A. erdvenbergianae* proxima sed ramis veteribus lenticellis prominentibus praeditis, foliis haud hirsutis margines versus et alabastris obpiriformibus differt.

Liana, hermaphrodite; young branches cobwebby, terete, older sparsely cobwebby, glabrescent, with prominent cleft lenticels, occasionally with scars from shoot abscission; *trichomes* cobwebby, white or rusty colored, or unbranched short trichomes. *Stipules* 2–3 mm, triangular; *leaves* simple, caducous; petioles 2.9–4.5 cm; blade 6.9–9.3 × 7.1–9.7 cm, widely-ovate, when young cobwebby on both sides, mature blades sparsely cobwebby and puberulent along vein and nerves in adaxial side, cobwebby in abaxial side, base sagittate, lobes sometimes overlapping, margin toothed, sometimes slightly 3-lobed, apex acute or rounded, papery. *Inflorescences* 20–25.4 × 11.2–37 cm, panicles with long lateral branches; peduncles 3.9–12.1 cm, cobwebby, green; pedicels 2–3 mm, glabrous, red. *Flower* buds obpyriform, red; calyx 0.7 mm diam, gamosepalous, cotyliform, truncate, glabrous; corolla in bud 1.3–1.5 × 1–1.3 mm, petals 5, 2.6 × 0.8 mm, elliptic, coherent by margins, caducous, glabrous; stamens 5, 1.6–2.3 mm, filaments red, anthers 0.5 mm long, disc adherent to ovary, disc and pistil 0.9 × 0.6 mm, red, 5-sulcate, ovary apex red, glabrous, style obsolete, stigma punctate. *Berry* 8–10 mm, spherical, purple; seeds (1)3 or 4, 4.7–5.8 × 3.8–4 mm, heart-shaped, smooth, brown.

Distribution and ecology. *Ampelocissus mesoamericana* occurs in low deciduous forests, high subevergreen forests, and dry savannahs on slopes at altitudes of 60–1350 m in Mexico and El Salvador. Flowering in January and February, fruiting in February, April, and May–August.

I had overlooked this species while studying *Ampelocissus* specimens for their treatment in *Flora Neotropica*. *Ampelocissus mesoamericana* is very similar to *A. erdvendbergiana* (illustration in Lombardi, 2000: 21) in the inflorescence with long lateral branches (vs. short branches in sympatric *A. acapulcensis* (Kunth) J. E. Planchon) and mature leaves absent at flowering time, but *A. mesoamericana* differs from *A. erdvendbergiana* in the prominent lenticels that mimic little emergences (vs. smooth branches), the leaf margin not hirsute (vs. hirsute), and the obpyriform flower buds (vs. spherical).

Paratypes. MEXICO. **Chiapas:** Chiapa de Corzo, El Chorreadero 9 km E of Chiapa de Corzo along Hwy. 190, *D. E. Breedlove 8462* (F); Tuxtla Gutiérrez, along road to El Sumidero de Tuxtla, 20 km N of Tuxtla Gutiérrez, *D. E. Breedlove 9050* (F, US); La Trinitaria, along Hwy. 190, 21 km S of La Trinitaria, *D. E. Breedlove & P. H. Raven 8439* (F); Tzimol, ca. 7 km SE of Comitán, ca. 3 km SE of Tzimol, *R. J. Hampshire, A. Reyes-Garcia & L. Hernández Z. 1148* (BM); Chiapa de Corzo, El Chorreadero 9 km E of Chiapa de Corzo along Hwy. 190, *R. M. Laughlin 193* (F, MEXU); W of La Concordia, along the Río de la Concordia, *A. S. Ton 2444* (F); Avispero, Comitan-Motozintla, *E. H. Xolocotzi X-1398* (MEXU). **Veracruz:** Tepetzintla, Tierra Blanca, camino para la Sierra de San Juan Otontepec, *J. Calzada 5523* (F). GUATEMALA. **Zacapa:** Serra de Las Minas, Loma El Picacho, above Santa Rosalía, *J. A. Steyermark 42732* (F). HONDURAS. **La Paz:** Quebrada Salada, 1 km al N de La Paz, valle de Comayagua, *B. K. Holst 1622* (TEFH). EL SALVADOR. **Ahuachapán:** near Salto de Atehuecía, *P. C. Standley & E. Padilla V. 2863* (F). **Santa Ana:** vicinity of Metapán, *P. C. Standley & E. Padilla V. 3085* (F).

Acknowledgments. I thank Gerrit Davidse for the invitation to collaborate on the *Flora Mesoamericana* project, T. S. Filgueiras for the Latin diagnosis, Conselho Nacional de Desenvolvimento Cientifico e Tecnológico (CNPq) for a research fellowship grant (300220/2003-0), and Fundação de Amparo a Pesquisa do Estado de São Paulo (FAPESP) for financial support (2005/02654-1).

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Especie Nueva de *Croton* (Euphorbiaceae) de Brasil

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Resumen. Se describe *Croton longibracteatus*, especie nueva de Brasil. Esta especie pertenece a *Croton* sec. *Barhamia* (Klotzsch) Baillon y se considera cercana a *C. muscicapa* Müller Argoviensis, con la cual se compara y se distingue por las estípulas bien desarrolladas, las bractéolas más grandes, los sépalos pistilados más grandes y acrescentes y los estambres exsertos. Se presenta una clave para distinguirlas y una ilustración de la especie.

Abstract. *Croton longibracteatus* (Euphorbiaceae), a new species from Brazil, is described and illustrated. It belongs to *Croton* sect. *Barhamia* (Klotzsch) Baillon and appears similar to *C. muscicapa* Müller Argoviensis, but differs from the latter by presenting well-developed stipules, larger bracteoles, large and accrescent pistillate sepals, and exserted stamens. A dichotomous key for distinguishing both taxa and an illustration of the new species are included.

Key words: *Barhamia*, Brazil, *Croton*, Euphorbiaceae.

El género *Croton* L. está ampliamente distribuido en las regiones tropicales de la tierra. En América se encuentran 33 secciones de las 40 en las cuales se dividió al género (Webster, 1993), 29 de ellas son endémicas de este continente (Martínez, 1996). Una de las secciones reconocidas de *Croton* es *Barhamia*, que presenta aproximadamente 18 especies y se encuentra relacionada con dos secciones americanas: *Micranthis* Baillon y *Medea* (Klotzsch) Baillon. La sección *Barhamia* se distingue por ser arbustos con hojas generalmente dentadas, sin glándulas conspicuas en el ápice del pecíolo; estípulas con glándulas, lobadas o ligeramente disectadas; estambres 5 a 12; sépalos de las flores pistiladas con glándulas marginales y/o abaxiales y los estilos multífidos (Webster, 1993).

En el Herbario de la Facultad de Ciencias (FCME) se comenzó el estudio de *Croton* sec. *Barhamia* en años recientes y se hicieron análisis filogenéticos basados en caracteres morfológicos en donde se encontró un clado que incluye a especies con los pedicelos femeninos largos, las hojas brillantes y los tricomas, cuando presentes, debajo de una capa de exudado, dando la impresión de que la lámina es glabra y víscida en ambas caras.

En esta revisión se solicitaron ejemplares de diferentes herbarios de Brasil y de los Estados Unidos de América y dentro de los mismos se obtuvieron especímenes de *Croton muscicapa* Müller Argoviensis, un taxón perteneciente al clado mencionado, que sin embargo presenta ejemplares con características diferentes y que al examinarlos con detenimiento son suficientes para considerarla como una especie distinta, la cual se propone en este trabajo.

Croton longibracteatus Martínez Gordillo & de Luna, sp. nov. TIPO: Brasil. Bahia: about 7–10 km along Seabra–Itaberuba road W the Lençois turning, by Rio Mucugizinho, 41°26′W, 12°28′S, 800 m, 27 May 1980, *R. M. Harley 22675, G. L. Bromley, A. M. De Carvalho, J. M. Soares, J. L. Hage & E. B. Dos Santos* (holotipo, NY). Figura 1.

Frutex 1–2 alta. Folia ovato-deltata, apice acuminata, margine denticulata; stipulae lanceolatae. Inflorescentia 8–14 cm longa; bractea 13–33 mm longa, lineari-lanceolata, caduca; bracteolae lanceolatae, glandulis stipitatis margine. Stamina 10, exserta; sepala pistilata lanceolata, acrescentia, glandulis stipitatis dense obsita. *C. muscicapae* affinis sed stipulis lanceolatis, inflorescentiis majusculis et staminibus 10 exsertis differt.

Arbustos 1–2 m, monoicos. *Hojas* 4.6–6.5 × 2.5–4.3 cm, ovado-deltadas; ápice acuminado, margen denticulado, dientes con glándulas sésiles en el ápice, base cordata; 5 venas a la base; haz y envés glabrescentes, con algunos pelos estrellados sobre las venas; pecíolo 1.5–5.4 cm, con algunos pelos simples; estípulas 2.5–6 mm, lanceoladas,

Figura 1. *Croton longibracteatus* Martínez Gordillo & de Luna. —A. Rama con flores. —B. Flor estaminada. —C. Flor pistilada. —D. Semilla. —E. Bráctea de la base de la inflorescencia. —F. Margen de la hoja. —G. Estípula. A, C, F y G, del holotipo (*Harley et al. 22675*, NY); B, *Harley 18566* (NY); D, *Mori & Boom 14258* (NY); E, *Mori et al. 13113* (NY).

caducas, margen con glándulas botuliformes, sésiles, cara adaxial glandular, concentradas en la base. *Inflorescencia* 8–14 cm; bráctea 13–33 × 2–5 mm, linear-lanceolada, margen con glándulas estipitadas, base con una glándula circular prominente, generalmente caduca; bractéolas 7–15 mm, lanceoladas, margen con glándulas estipitadas. *Flores estaminadas* pediceladas, pedicelo 2–4.5 mm, sépalos 3.5–5.5 × 2–2.8 mm, oblongo-ovados, unidos sólo a la base, cara adaxial glabra, cara abaxial glabrescente, con algunos pelos estrellados en la base, glándulas impresas presentes, con un mechón de pelos en el ápice; pétalos 4–6 × 2–3 mm, elípticos, cara adaxial y abaxial glabras, margen peloso, glándulas impresas presentes; estambres 10, exsertos, filamentos glabros, conectivo glandular; *flores pistiladas* pediceladas, pedicelo 2.5–5 mm, sépalos unidos en la base, lanceolados, acrescentes, margen glandular, cara adaxial glabrescente, cara abaxial glandular-estipitada; ovario esférico, hirsuto, estilos divididos mas de una vez, glabrescentes, libres casi a la base, 9 a 12 estigmas. *Fruto* 6–9 × 5–9 mm, esférico, lobulado en el ápice; semillas 3.5–5.5 × 3–4 mm, elipsoides, cafés, lisas.

Fenología. Se ha colectado de febrero a diciembre, en todos los casos presenta flores en diferentes estados de desarrollo.

Distribución. Hasta el momento se localiza en el estado de Bahía donde crece en sitios con suelos pedregosos y vegetación baja, de 100 a 1200 m de altitud.

Discusión. Es una especie perteneciente a *Croton* sec. *Barhamia*, que se encuentra relacionada con cuatro especies que muestran hojas glabras y víscidas por el exudado que las cubre y que se hallan en Sudamérica. Todas, excepto *C. perviscosus* Croizat de Paraguay, se localizan solamente en el estado de Bahía, Brasil, de donde son endémicas y se desarrollan en lugares abiertos y pedregosos. En los herbarios del Jardim Botânico do Rio de Janeiro (RB), del New York Botanical Garden (NY) y de la Universidade de São Paulo (SPF), estos ejemplares se han identificado como *Croton muscicapa*, especie que se considera más cercana, difiere porque presenta estípulas bien desarrolladas, las bractéolas y los sépalos pistilados más grandes y los estambres exsertos. A continuación se presenta una clave que separa a las especies de este grupo. Las características de *C. perviscosus* se obtuvieron de la descripción original porque no se tiene ningún ejemplar.

Clave para Diferenciar a *Croton longibracteatus*, de Bahía, Brasil, de las Especies Relacionadas

1a. Hojas elípticas u obovadas, pedicelos de la flor pistilada de 2–3 mm de largo, estípulas serradas . . . . . *C. perviscosus* Croizat.
1b. Hojas ovadas o deltadas, pedicelos de la flor pistilada 2.5–14 mm de largo, estípulas no serradas.
  2a. Hojas con el ápice agudo, bractéolas enteras, con glándulas sólo en la base . . . . . *C. glutinosus* Müller Argoviensis.
  2b. Hojas con el ápice redondeado o acuminado, bractéolas con el margen glandular.
    3a. Hojas con el ápice redondeado, 14 a 18 estigmas . . . . . *C. betulaster* Müller Argoviensis.
    3b. Hojas con el ápice acuminado, 9 a 12 estigmas.
      4a. Ápice de la hoja largo acuminado, margen denticulado, estípulas lanceoladas, inflorescencia 8–14 cm, glándulas de las bractéolas estipitadas, estambres 10, exsertos, sépalos de la flor pistilada con glándulas estipitadas . . . . . *C. longibracteatus* sp. nov.
      4b. Ápice de la hoja corto acuminado, margen crenado, estípulas representadas por glándulas esféricas, inflorescencia 2.2–5.2 cm, glándulas de las bractéolas sésiles, estambres 12, no exsertos, sépalos de la flor pistilada con glándulas no estipitadas . . . . . *C. muscicapa* Müller Argoviensis.

Paratipos. BRASIL. **Bahía:** Mun. Mucugé, Mucugé, *H. P. Bautista 1392* (RB); Refugio Ecológico (Campo Rupestre) *H. P. Bautista 1392* (RB); km 24 Mucugé–Andorai, *A. Allem 1795 & G. Vieira* (NY); Serra do Sincará, 6.5 km al SO de Mucugé, sobre la carr. al Cascavel, *R. M. Harley 21017* (NY); 5 km al S de Andorai sobre la carr. a Mucugé por el puente sobre el río Paraguazu, *R. M. Harley 18566* (NY); por el río Aimbuca, ca. 3 km al S de Mucugé, sobre la carretera a Cascavel, *R. M. Harley 15919* (NY); 3 km al S de Mucugé, en la entrada que va para Jussiape, *S. A. Mori, R. M. King, T. S. Dos Santos & R. Pinto 12585* (NY); mun. Andorai, Sierra de Andorai-Capa Bode, entrada por Mucugé, campos rupestres, *G. Martinelli 5417* (RB); Andorai, Río San Antonio, *C. Toledo Rizzini & Maltus 1066* (RB, MO); 5 km al sur de Andoraí, sobre la carr. a Mucugé, por la orilla, sobre el río Piraguacú; *R. M. Harley 18566* (NY); 1 km al S de Andoraí, campo rupestre, *I. P. de Queiroz 1809* (NY); Nova Rodovia Andorai–Mucugé, a 3 km al S de Andorai, campo rupestre, *S. A. Mori & F. P. Benton 13113* (NY); mun. Lençois, a lo largo BR 242, a 15 km al NO de Lençois, al km 225, campo rupestre, *S. A. Mori & B. M. Boom 14258* (NY); estrada entre Lençois e Seabra, 20 km NO de Lençois, *R. M. Harley, C. M. Sakaragui, P. T. Sano, S. Atkins & V. C. Souza 14037* (SPF, FCME).

Agradecimientos. A los curadores de los herbarios del Jardim Botânico do Rio de Janeiro (RB), del New York Botanical Garden (NY) y de la Uni-

versidade de São Paulo (SPF), por los préstamos de ejemplares de *Croton* sec. *Barhamia*. A Ramiro Cruz Durán por la ilustración de la especie. A José Antonio Hernández, del laboratorio de Microcine, de la Facultad de Ciencias, UNAM, por la captura en imagen digital de la ilustración.

Literatura Citada

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New Species and Combinations in *Heterotaxis* Lindley (Orchidaceae: Maxillariinae)

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Abstract. Two undescribed species were detected while conducting a phylogenetic study of *Heterotaxis* (Orchidaceae: Maxillariinae): *H. fritzii* Ojeda & Carnevali from western Ecuador and *H. schultesii* Ojeda & G. A. Romero from the Amazon basin of Colombia and Brazil. These two species are described and illustrated, and their affinities are discussed. The first novelty is related to *Heterotaxis sessilis* (Swartz) F. Barros but the leaves are triquetrous, fleshier, and much narrower, while *H. schultesii* is similar to *H. villosa* (Barbosa Rodrigues) F. Barros, but with narrower, more coriaceous leaves and orange-red flowers. Six species are transferred to *Heterotaxis*: *H. discolor* (Loddiges ex Lindley) Ojeda & Carnevali, *H. equitans* (Schlechter) Ojeda & Carnevali, *H. maleolens* (Schlechter) Ojeda & Carnevali, *H. microiridifolia* (D. E. Bennett & E. A. Christenson) Ojeda & Carnevali, *H. santanae* (Carnevali & I. Ramírez) Ojeda & Carnevali, and *H. valenzuelana* (A. Richard) Ojeda & Carnevali. In addition, a lectotype and an epitype are designated for *Camaridium equitans* Schlechter, while lectotypes are chosen for *Camaridium vandiforme* Schlechter and *Dicrypta irisphyta* Barbosa Rodrigues. Lastly, *Maxillaria valenzuelana* subsp. *angustifolia* J. T. Atwood is treated for the first time as a synonym of *Heterotaxis valenzuelana*.

Resumen. Se detectaron dos especies nuevas en un estudio filogenético de *Heterotaxis*: *H. fritzii*, de Ecuador occidental y *Heterotaxis schultesii*, de la cuenca amazónica de Brasil y Colombia. Estas dos nuevas especies son descritas, ilustradas y sus afinidades discutidas. La primera novedad está relacionada con *Heterotaxis sessilis* (Swartz) F. Barros pero las hojas son tríquetras, mas carnosas y angostas, mientras que *H. schultesii* es similar a *H. villosa* (Barbosa Rodrigues) F. Barros, pero con hojas más angostas y coriáceas y flores naranja rojizo. Otras seis especies son transferidas a *Heterotaxis*: *H. discolor* (Loddiges ex Lindley) Ojeda & Carnevali, *H. equitans* (Schlechter) Ojeda & Carnevali, *H. maleolens* (Schlechter) Ojeda & Carnevali, *H. micro-iridifolia* (D. E. Bennett & Christenson) Ojeda & Carnevali, *H. santanae* (Carnevali & I. Ramírez) Ojeda & Carnevali y *H. valenzuelana* (A. Richard) Ojeda & Carnevali. Adicionalmente, se selecciona un lectotipo y un epitipo para *Camaridium equitans* Schlechter y lectotipos para *Camaridium vandiforme* Schlechter y *Dicrypta irisphyta* Barbosa Rodrigues. Por último, *Maxillaria valenzuelana* subsp. *angustifolia* J. T. Atwood es tratada por primera vez como sinónimo de *Heterotaxis valenzuelana*.

Key words: *Heterotaxis*, Maxillariinae, Orchidaceae.

Maxillariinae is one of the most conspicuous and diverse subtribes of the Neotropical Orchidaceae. It is composed of 400 to 450 species (e.g., Atwood & Mora de Retana, 1999; Carnevali & Ramírez, 2003), approaching 650 species in other recent calculations (e.g., Dodson, 2002). They are common and widespread elements in humid Neotropical forests and range from southern Florida (U.S.A.) to northern Argentina, with centers of diversity in southern Central America, along the Andes, and in southeastern Brazil (Dressler, 1981, 1993; Carnevali, 1991; Senghas, 1993; Whitten et al., 2000).

Members of Maxillariinae are extremely variable in vegetative morphology and size, varying in height from 1 cm to 2 m. Plants bear heteroblastic pseudobulbs (i.e., of 1 internode) or lack pseudobulbs altogether and feature 1 to 2(to 4) leaves per stem or pseudobulb. Rhizomes are short, branching or

not, forming erect, ascendent, or pendulous plants. Plants are epiphytic or secondarily terrestrial in habit. Growth may be either monopodial or sympodial. Despite all this vegetative plasticity, the flowers are remarkably homogeneous in overall structure throughout the subtribe (Carnevali & Ramírez, 1989; Carnevali, 1991; Holtzmeier et al., 1998; Dodson, 2002). Thus, the phylogenetic relationships of the several morphologically recognizable groups within the subtribe and their circumscriptions have been difficult to ascertain, partially because the great vegetative plasticity of the group is not obviously associated with an equivalent, correlated floral variability.

Until recently, orchid systematists had recognized the following genera in the Maxillariinae: *Cryptocentrum* Bentham, *Mormolyca* Fenzl, *Chrysocycnis* Lindley & Reichenbach f., *Cyrtidiorchis* Rauschert, *Anthosiphon* Schlechter, *Pitiphyllum* Schlechter, *Trigonidium* Lindley, and *Maxillaria* Ruiz & Pavón (Dressler, 1993; Atwood & Mora de Retana, 1999; Dodson, 2002; Carnevali & Ramírez, 2003). However, recent phylogenetic analyses using DNA sequences (Whitten et al., 2000; Whitten, unpublished) have resulted in a broader understanding of the relationships within the subtribe and among some of the groups included within *Maxillaria*. The most striking result of these new analyses is, perhaps, evidence indicating that the large genus *Maxillaria*, as currently circumscribed, is grossly polyphyletic. Alternatively, the circumscription of the genus would have to be expanded in such a way as to be morphologically undiagnosable and ecologically and biogeographically meaningless, since it would include all members of subtribe Maxillariinae with conduplicate leaves. Furthermore, the circumscription of subtribe Maxillariinae has also recently been expanded to include subtribes Lycastinae and Bifrenariinae (Whitten et al., 2000), in disagreement with the currently accepted circumscription that in a narrow sense encompasses only species with conduplicate leaves, therefore excluding Lycastinae and Bifrenariinae (the plants of which bear plicate leaves).

Thus, relationships within subtribe Maxillariinae s. str. beg for a generic realignment to recognize generic aggregations that, besides being monophyletic, would be more manageable in size, morphologically diagnosable, and that would reflect ecological preferences and biogeographical patterns. The circumscriptions of some genera surely will require broadening, while other smaller monophyletic groups, most of them formerly included within *Maxillaria*, will deserve generic recognition (Ojeda, 2003; Whitten, unpublished; Ojeda & Carnevali, in prep.).

Among the several monophyletic groups recognized by the preliminary phylogenetic analyses there is a basal clade that can be identified by a combination of morphological features. One of the most conspicuous of them is the presence of fleshy flowers as opposed to the typically fibrous flowers of most members of the subtribe. Within this clade there are three monophyletic groups. One of them, *Heterotaxis* Lindley, has been recently reinstated (Barros, 2002), and this circumscription is strongly supported by our phylogenetic work that places *Heterotaxis* in a basal position in the phylogeny of *Maxillaria*, or of the conduplicate-leaved Maxillariinae, more closely related to other taxa (such as *Ornithidium* Salisbury, *Mormolyca*, and *Cryptocentrum*) than with the "core" *Maxillaria* (Ojeda et al., in prep.; Whitten et al., 2000; Whitten, unpublished) typified by *Maxillaria platypetala* Ruiz & Pavón (e.g., Dodson, 2002).

Heterotaxis comprises about eleven primarily epiphytic species ranging from the southeastern United States (Florida) and the Greater Antilles to Brazil, with most of the species occurring in Central and South America (Carnevali, 1991). As in *Maxillaria* s. str., the inflorescence in *Heterotaxis* is 1-flowered and emerges from the leaf axils. The flowers are yellow to orange or orange-red, with the labellum in some species being totally purple, or more rarely pinkish lips with calli varying in size and texture; in some other species the lamina of the labellum is basically yellow or orange with purple or reddish spots or blotches. The distinctly fleshy flowers are shared with the *Ornithidium* complex of *Maxillaria* (a related group of taxa that may also merit generic recognition). *Heterotaxis* is characterized by short rhizomes and laterally compressed, oblong pseudobulbs, which are unifoliate, and subtended by various leaf-bearing sheaths. Exceptions are *Maxillaria equitans* Schlechter, and *Maxillaria valenzuelana* (A. Richard) Nash, which exhibits a pseudomonopodial growth without pseudobulbs. Based on this growth habit difference, Hoehne (1947) proposed *Marsupiaria* based on *Maxillaria valenzuelana*, where he also included *Maxillaria equitans*.

It has been hypothesized (e.g., Carnevali, 1991) that *Maxillaria witsenioides* Schlechter (syn: *Marsupiaria witsenioides* (Schlecter) Pabst) also belongs in this group because of its monopodial growth habit with laterally compressed leaves. However, recent evidence from the internal transcribed spacers sequence (ITS) along with a detailed morphological re-evaluation of *M. witsenioides* (Ojeda & Carne-

vali, unpublished) clearly shows this taxon to be unrelated to the members of *Marsupiaria* and places the species as a member of a clade that includes *Maxillaria aciantha* Reichenbach f. and *Maxillaria notylioglossa* Reichenbach f. (N. H. Williams, unpublished).

Heterotaxis was based on a species described in 1826 by John Lindley as *Heterotaxis crassifolia*. This species was treated until recently as *Maxillaria crassifolia* (Lindley) Reichenbach f. (= *Heterotaxis sessilis* Lindley). The same concept was later redescribed by Lindley as *Dicrypta crassifolia* Lindley (Lindley, 1830). Although Lindley argued against his earlier generic concept, the *International Code of Botanical Nomenclature* (Greuter et al., 2000) should be followed in applying the Principle of Priority. Thus, the name to be used to refer to these taxa is the older *Heterotaxis* Lindley, sensu Lindley, 1826.

Most authors have treated members of this complex of taxa within a broadly circumscribed *Maxillaria* (e.g., Foldats, 1970; Carnevali, 1991; Senghas, 1993; McLeish et al., 1995; Christenson, 1999), although several had pointed out the possibility of generic recognition (e.g., Brieger & Illg, 1972; Illg, 1977; Carnevali, 1991; Carnevali & Ramírez, 2003) or had already segregated totally or partially the group into new genera or through the resurrection of older genera (e.g., Hoehne, 1947). The group had already been recognized as distinct in several features, including characteristics of pollinia and cytology (Carnevali, 1991) as well as by the fleshy flowers. Recently, Christenson (1999) based on morphological characters, recognized this aggregate of species as *Maxillaria* sect. *Iridifolia*. John T. Atwood (unpublished) recognized the *Heterotaxis* alliance that, together with sub-alliances Crassifolia and Valenzuelana, comprises the *Heterotaxis* complex. More recently, a paper published by Barros (2002) recognized *Heterotaxis* and transferred four Brazilian species of this complex. Finally, in the course of a systematic and phylogenetic study of the Maxillariinae in general and of the *Heterotaxis* complex in particular that was based on morphology, gross foliar anatomy, and DNA sequences (nuclear ITS1 and ITS2 regions), additional evidence was obtained that supports the idea that *Heterotaxis* deserves generic recognition (Ojeda, 2003).

The objective of this contribution is to describe two new species that were detected in the course of the systematic analysis of the genus *Heterotaxis*. We then proceed to formalize the nomenclatural novelties required to update the circumscription and nomenclature of the genus, making six names available for general systematic and floristic usage.

Heterotaxis fritzii Ojeda & Carnevali, sp. nov. TYPE: Ecuador. Imbabura: Lita-Alto Tambo area, probably along the road from Lita to San Lorenzo, flowering in cultivation in Gainesville, Florida, U.S.A., 24 Feb. 2004, *M. W. Whitten 2672* (holotype, FLAS). Figures 1, 2.

Species haec *H. sessili* (Swartz) F. Barros similis sed habito parviore, foliis triquetris proportione angustioribus brevioribus, callo parte anteriore farinoso differt; *H. santanae* (Carnevali & I. Ramírez) Ojeda & Carnevali in mentem revocans sed foliis triquetris proportione angustioribus, labello acuto recedit.

Plant caespitose, sub-terrestrial, presumably also epiphytic, erect, ca. 25 cm tall, rhizome unknown but presumably abbreviated; roots grayish, ca. 2 mm diam.; pseudobulbs small, 1–2 × 0.4–0.6 cm, narrowly ellipsoid, unifoliate, partially or totally hidden by sheaths of which the innermost 2 to 3(to 4) on each side bear foliar blades. Leaves and the foliar blades of the sheaths distichous, 6–13 × 0.45–0.55 cm, thickly fleshy, linear-elliptic, subtriquetrous with the upper margins rounded (thus somewhat heart-shaped in cross section), unequally 2-lobed at apex, lobes obtuse, basally not constricted into a pseudopetiole; base and margins of leaves and sheaths dull green-yellow. Inflorescence one-flowered, ca. 4.5 cm long, borne on the leaf-sheath axils; floral bract 1.5 cm long, much shorter than ovary, the last bract of the peduncle surpassing the articulation of the pedicel to the ovary and pedicel; ovary and pedicel ca. 10 mm long, 3 mm thick. Flowers medium sized or small for the genus, ca. 17 mm long, fleshy, clear yellow-green; perianth segments subparallel to the column; sepals 16.5–17.5 × 4.5–5.5 mm, sub-similar with the laterals somewhat oblique, oblong-elliptic, acute; petals 14.5–15.5 × 2.4–2.6 mm, oblanceolate to spatulate, margin entire; labellum 14.5–15.5 × 4.5–5.5 mm, slightly 3-lobed, rhombic-ellipsoid in general outline, apex acute, basally cuneate, yellow with 2 series of large dark red or maroon spots or blotches that run parallel to the calli (4 to 7 on each side), articulated to the column foot; disc dull yellow, with two linear calli that are parallel to the main axis of the labellum, the basal callus is placed in the basal half of the disc, fleshy, the second callus is placed in the apical half of the disc and is farinose (mealy); column ca. 8 mm long, 2 mm thick, green-yellow, strongly arcuate, hemi-cylindrical, wider at base, with a poorly defined foot ca. 1 mm long; anther unilocular with papillose margin, ca. 3 mm long, dull yellow; pollinia 4, unequal. Fruits not seen.

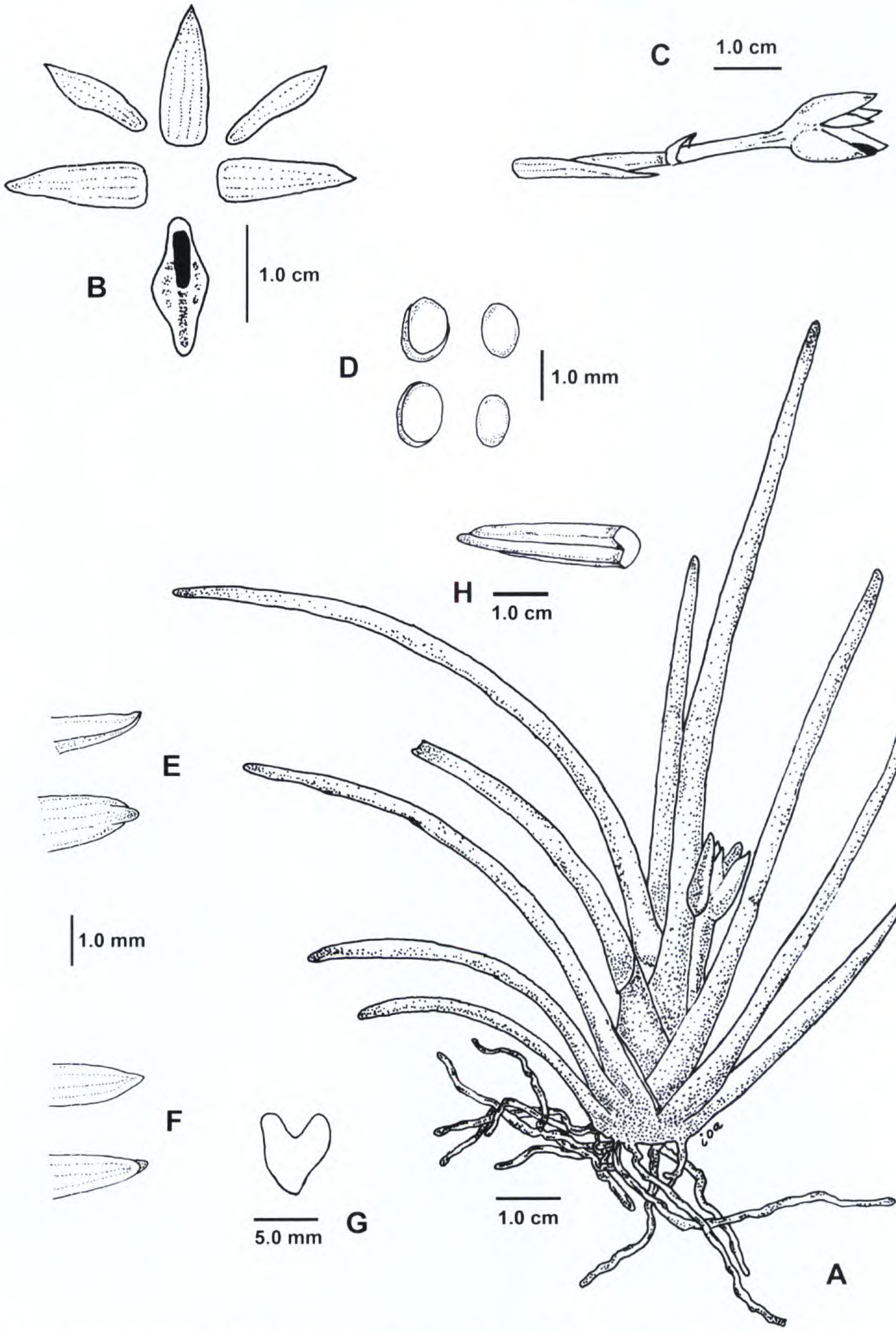

Figure 1. *Heterotaxis fritzii* Ojeda & Carnevali. —A. Plant habit. —B. Perianth. — C. Flower with peduncle and last two sheaths. —D. Pollinia. —E. Sepals from top: ventral and dorsal view. —F. Petals from top: ventral and dorsal view. —G. Leaf in cross section. —H. Apex of leaf. Drawn by Isidro Ojeda (based on paratype, *Carnevali 3443*, and supplemented with photographs).

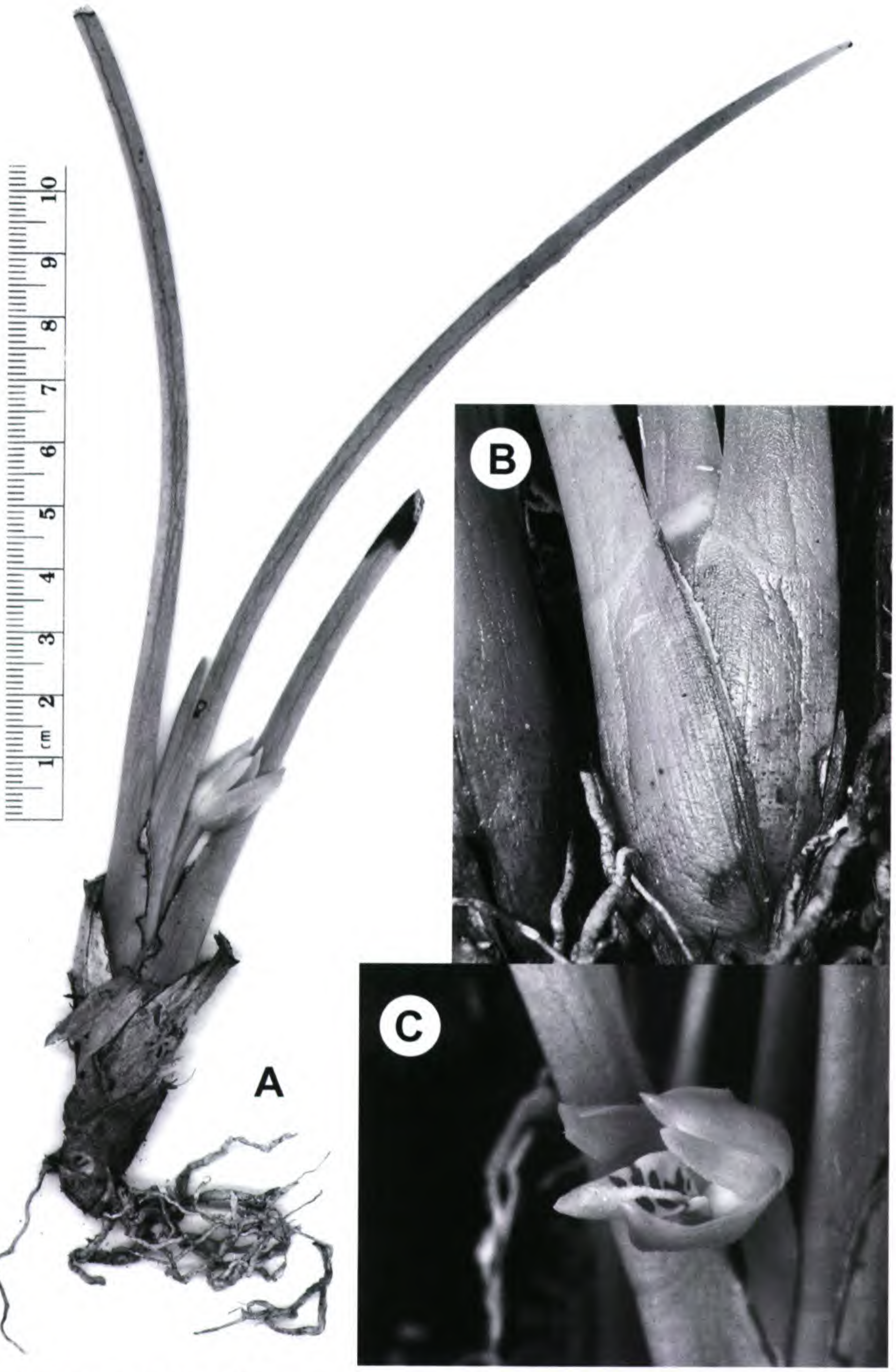

Figure 2. *Heterotaxis fritzii* Ojeda & Carnevali. —A. Plant habit. —B. Base of plant showing partially hidden pseudobulb. —C. Close-up of flower, showing the two calli of the labellum. Photographs by W. M. Whitten (based on living material later preserved as holotype).

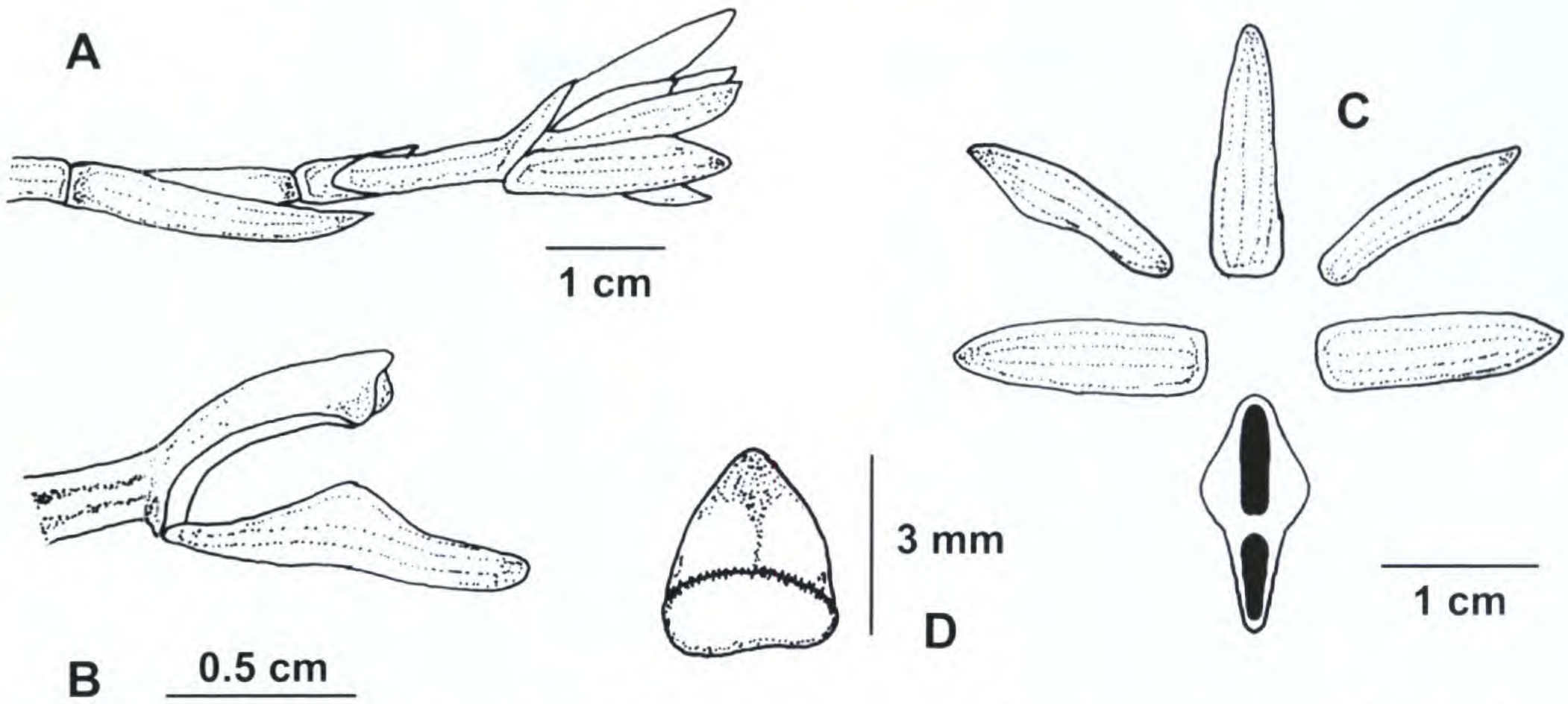

Figure 3. *Heterotaxis schultesii* Ojeda & G. A. Romero. —A. Flower with peduncle showing two last sheaths. —B. Column with labellum articulated. —C. Perianth. —D. Anther. Drawn by Isidro Ojeda (based on paratype *R. E. Schultes & I. Cabrera 12788*).

Eponymy. Named in honor of William Fritz of Union, Missouri, who cultivated a plant of this species for several years when he lived in St. Louis, Missouri.

Until recently, this species was only known from a 1994 collection made by one of us (Carnevali) and C. H. Dodson along the orchid-laden road from Lita to San Lorenzo, Imbabura, in western Ecuador. Subsequent trips to this locality by C. H. Dodson failed to reveal more plants. However, several plants of the species have recently been collected from the same general area and brought into cultivation. The holotype of the species was prepared from one of these plants. *Heterotaxis fritzii* at first looks morphologically intermediate between *H. valenzuelana* and *H. sessilis*, neither of which grows nearby. Both *H. valenzuelana* and *H. sessilis* have broader leaves than those of *H. fritzii*. *Heterotaxis sessilis* is only known in Ecuador from Los Rios and Guayas at lower elevations and drier areas (e.g., *Haught 3128* (AMES, MO), but these Ecuadorian collections might be referable to the entity described as *Maxillaria gatunensis* Schlechter, possibly distinct from *H. sessilis*). *Heterotaxis fritzii* superficially resembles *H. sessilis*, but is a smaller plant overall with fleshier leaves that are laterally fused and triangular in cross section. The lip is similar in shape to that of *Heterotaxis sessilis* but with two calli (versus one callus in *H. sessilis*). Phenetically, *Heterotaxis fritzii* is, however, more similar to *H. santanae* (Carnevali & I. Ramírez) Ojeda & Carnevali, with which it shares the small vegetative size, narrow leaves, overall habit, and similar flowers. The labellum in *H. santanae* has a rounded or obtuse apex and it lacks the dark purple transversal blotches found in the labellar disk of *H. fritzii*, among other floral differences. *Heterotaxis santanae*, furthermore, grows on the eastern side of the Andes, while the novelty here proposed is apparently restricted to the Pacific coast of northern Ecuador.

Distribution and habitat notes. *Heterotaxis fritzii* is poorly known, since it has only been collected a few times and only seen alive once by the authors. At the paratype locality it grew as a subterrestrial on a moist and shady road bank, along with many other orchid species (*Scaphyglottis* sp. aff. *sumersii* C. Schweinfurth, *S. prolifera* Cogniaux, *Maxillaria cymbidioides* Dodson, J. T. Atwood & Carnevali, *Epidendrum ramosum* Jacquin). The single plant found then grew slowly in cultivation in St. Louis, Missouri, for several years, but never thrived and eventually died without ever flowering again (see paratype).

Conservation status. Apparently a rare, narrow endemic in coastal Ecuador. Since it has no horticultural appeal, it is probably not under any particular collecting pressure.

Paratype. ECUADOR. **Imbabura:** 5–14 km SE of Lita along road to Ibarra, 600–850 m, plants collected along road embankments, 27 Mar. 1994, *G. Carnevali & C. H. Dodson 3443* (CICY).

Heterotaxis schultesii Ojeda & G. A. Romero, sp. nov. TYPE: Brazil. Amazonas: Río Urubú, between Cachoeira Iracema & Manaos–Caracarai road, 6 June 1951, *G. T. Prance, D. Philcox, W. A. Rodrigues, J. F. Ramos & L. G. Farias 5023* (holotype, NY; isotypes, A, F, HB, INPA, K, MG, NY, R, S, U, US). Figures 3, 4.

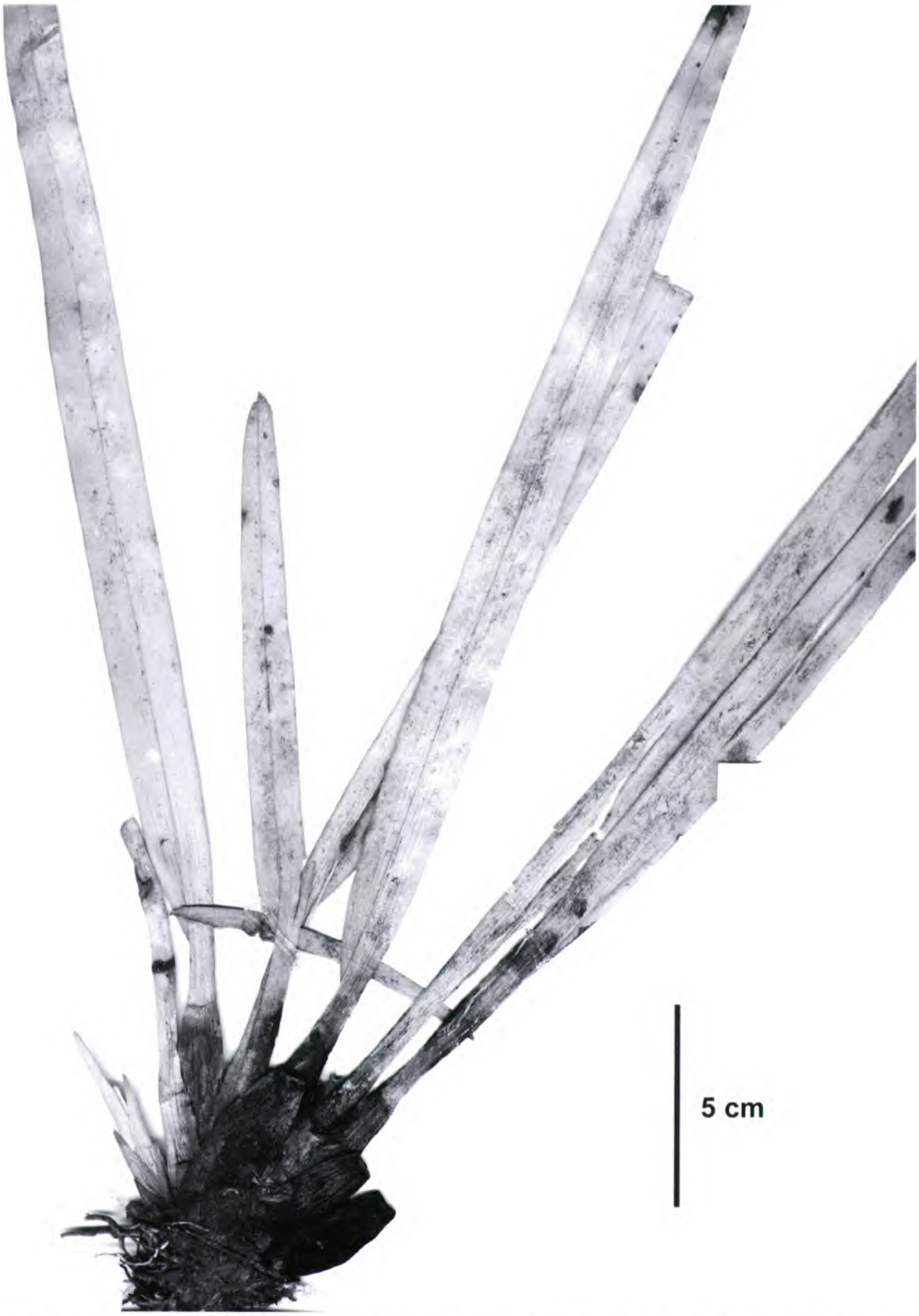

Figure 4. *Heterotaxis schultesii* Ojeda & G. A. Romero, flowering habit (based on *R. E. Schultes & I. Cabrera 17488* (AMES)).

Species haec *H. villosae* (Barbosa Rodrigues) F. Barros similis sed habitu parviore, foliis angustioribus crassioribus, apice lobis magni-inaequilateris, floribus fuscis-cinnabarinis, labello angustiore, callo biseriato carnoso abhorret.

Plant a caespitose epiphyte, erect, 20–40 cm high, rhizome abbreviated; roots grayish, about 0.2 cm diam.; pseudobulbs aggregate, 3.5–6 × 1–1.5 cm, oblong-ellipsoid and strongly compressed laterally, unevenly marked with dense longitudinal scars upon drying, unifoliate, clothed with 4 to 6 sheaths, the innermost 2 to 4 bearing foliar blades, these distichously arranged. Leaves coriaceous, erect on the pseudobulb apex, 17–28 × 1–1.7 cm, oblong, basally attenuate and forming a 1.5–6 cm long pseudopetiole, apex acute, unequally 2-lobed, the longer apical lobe 0.5–1 cm longer than the shorter, both lobes acute, inwardly oblique; leaf blades of the sheaths enveloping the pseudobulb, 1.5–5.5 × 0.8–1.5 cm, partially fused at the base (with a "y" cross section near the articulation), forming a relatively long pseudopetiole. Inflorescence 1-flowered, borne on the leaf-sheath axils; peduncle fleshy, 33–35 mm long, concealed by 5 distichous bracts, the last one surpassing the articulation of the peduncle to the ovary and pedicel; floral bract similar to peduncle bracts, membranous, ca. 5 mm long, triangular, acute, shorter than ovary; ovary and pedicel 10–11 mm long, ca. 2 mm thick. Flowers medium-sized for the genus, ca. 1.7 cm long., apparently erect on the pedicel, perianth segments subparallel to the column, yellow brown to orange or orange-red, fleshy; dorsal sepal 16–18 × 2.8–3.1 mm, lanceolate to oblong lanceolate, obtuse, lateral sepals similar to dorsal but slightly oblique; petals 14–16 × 1.8–2.1 mm, oblanceolate to spatulate, acute, the margins papillose from apex to mid-length; labellum articulate to column foot, 13.5–14.5 × 3.9–4.1 mm, slightly 3-lobed, apex obtuse to obtusely acute; disc with two calli, these fleshy, linear, the basal one originating at the base of the disc and extending to about mid-length, the apical callus borne near the attenuate point of the labellum blade and from there extending to near the apex; anther ca. 3.5 mm long, unilocular, the apical surface papillose; pollinia four, unequal; column 7–9 mm long, hemi-cylindric, arcuate, with a poorly defined foot 1–2 mm long. Fruits not seen.

Eponymy. Named in honor of Richard Evans Schultes, among the first collectors of this species.

Heterotaxis schultesii resembles *H. villosa*, but it is recognized at once by its smaller overall vegetative size (20–40 cm tall). The leaves are thicker in texture, with fewer cell layers (Ojeda, 2003) and narrower, compared to the wide leaves of *H. villosa*. Most distinctly, the apex of the leaves is conspicuously bilobed. The apical lobes of the leaf are so strongly unequal that the larger lobe is 0.5–1 cm longer than the shorter, a dimension that equals or exceeds the width of the leaf at its apical portion. This condition is not found in any other species of *Heterotaxis*. The labellum of *H. schultesii* is similar in shape to that of *Heterotaxis sessilis*, but the two fleshy calli are different. The brownish yellow to red-orange color of the flowers is unique in *Heterotaxis*.

Heterotaxis schultesii is probably only distantly related to *H. sessilis*. According to our results, *H. schultesii* lies, within the genus, in a basal position (Ojeda, 2003; Ojeda et al., 2003).

Distribution and habitat notes. Known from a few collections made in Amazonian Brazil (Amazonas) and Colombia (Vaupés). It grows as an epiphyte, and it has been reported as occurring on savannah trees (e.g., *Garay 108*), on flooded forests (e.g., *Garay 91*) or along rivers (e.g., *Prance et al 5023*). The known collections were made at altitudes ranging from 180 to 250 m.

Phenology. Flowering collections have been made in the months of June, August, and September; no fruiting specimens have been examined.

Paratypes. COLOMBIA. **Vaupés:** Río Piraparaná (trib., Río Apaporís), Caño Teemeeña, 10 Sep. 1952, *R. E. Schultes & I. Cabrera 17488* (AMES, CICY); Cerro de Yapobodá, Río Kuduyarí, 15 Aug. 1960, *L. A. Garay 108* (AMES, CICY); along Río Kuduyarí cerca de Mitú, 12 Aug. 1960, *L. A. Garay 91* (AMES); Río Kuduyarí, Yapobodá, savana con arenisca, 25 June 1958, *H. G. Barriga, R. E Schultes & H. Blohm 15892* (AMES); Río Apaporis entre Río Pacoa y el Río Kananarí, 21 June 1951, *R. E. Schultes & I. Cabrera 12788* (AMES); Río Apaporis entre Rio Pacoa y Rio Cananarí, 21 June 1951, *R. E. Schultes & I. Cabrera 12723* (AMES, K); Río Apaporis, 15 June 1952, *R. E. Schultes & I. Cabrera 16717* (AMES).

New Combinations

Phylogenetic work using ITS 1 and 2 and a suite of morphological and anatomical characters identified 11 taxa belonging in the *Heterotaxis* clade, itself part of the larger *Heterotaxis–Ornithidium* complex (Ojeda, 2003; Ojeda et al., 2003; N. H. Williams et al., in prep.). All share the generalized habit and vegetative architectures of *Heterotaxis* described above and the fleshy flowers characteristic of the *Heterotaxis–Ornithidium* complex. These species were: *Maxillaria discolor* Loddiges ex Loudon, *M. villosa*, *H. schultesii*, *M. maleolens* Schlechter, *M. violaceopunctata* Reichenbach f., *M. crassifolia*, *M. superflua*, *M. santanae* Carnevali & I. Ramírez, *H. fritzii*, *M. equitans*, and *M. valenzue-*

lana. As indicated above, Barros (2002) already transferred several of these taxa, all of them occurring in Brazil, to *Heterotaxis*.

Two additional species, also represented in Brazil, *Maxillaria equitans* and *M. valenzuelana*, were treated by Barros as members of the genus *Marsupiaria*. Our analysis strongly suggests that *Marsupiaria* is embedded within *Heterotaxis*, leaving a balance of six other species that are yet to be transferred to *Heterotaxis*. Of these, five species were included in the phylogenetic analysis performed by Ojeda et al. (2003), while a sixth one, the recently described *Maxillaria microiridifolia* D. E. Bennett & E. A. Christenson, although unavailable to us in the course of the present study, is clearly referable to *Heterotaxis* and closely related to (if not conspecific with) *Maxillaria santanae* Carnevali & I. Ramírez (transferred to *Heterotaxis* below). Thus, the following six new combinations are warranted:

Heterotaxis discolor (Loddiges ex Lindley) Ojeda & Carnevali, comb. nov. Basionym: *Dicrypta discolor* Loddiges ex Lindley, Edwards's Bot. Reg. 25: 91. 1839. 1858. *Maxillaria discolor* (Loddiges ex Lindley) Reichenbach f., in Walp. Ann. Bot. Syst. 6: 529. 1863. TYPE: Guyana ("Demerara"). Without precise locality, ex Hort. Loddiges (holotype, K-Lindl.).

As mentioned above, *Dicrypta* is without ambiguity a nomenclatural synonym of *Heterotaxis*.

Dicrypta bicolor Paxton ex J. E. Planchon often had been referred to the synonymy of *Maxillaria discolor* (e.g., Foldats, 1970: 449; Carnevali & Ramírez, 2003). We recently had the opportunity to research this name, and it is evident that its nomenclatural and systematic status is unclear. First of all, the authorship of the name cited by Planchon (1858) should be "Hort. ex J. E. Planchon," and the name appears on page 159 (not "Paxt. ex J. E. Planchon" or page 73, as cited by Foldats, 1970: 449 and Carnevali & Ramírez, 2003). "*Dicrypta bicolor* Bate." was also cited in the second supplement of Loudon's *Hortus Britannicus* (Loudon, 1839: 630). However, neither Planchon (1858: 159) nor Loudon (1839: 630) validate the corresponding horticultural name (K. Gandhi, pers. comm., 2005). Furthermore, the *World Checklist of Monocots* (2004) cites "*Dicrypta bicolor* (Ruiz & Pav.) Bateman ex Loudon, Hort. Brit., ed. 3, Suppl.: 630 (1839)" as a synonym of *Maxillaria bicolor* Ruiz & Pavón, which we strongly oppose, as there is no evidence linking Bateman's plant from "Demerara" (fide Loudon, 1839: 630) to the Andean plant described by Ruiz and Pavón. At this point we deferred any nomenclatural action until the status of *Dicrypta bicolor* is clarified.

Heterotaxis equitans (Schlechter) Ojeda & Carnevali, comb. nov. Basionym: *Camaridium equitans* Schlechter, Repert. Spec. Nov. Regni Veg. Beih. 7: 176. 1920. *Marsupiaria equitans* (Schlechter) Hoehne, Arq. Bot. Estado de São Paulo 2: 71. 1947. *Maxillaria equitans* (Schlechter) Garay, Bot. Mus. Leafl. 18: 208. 1958. TYPE: Repert. Spec. Nov. Regni Veg. Beih. 57: t. 63, fig. 242, 1929 (lectotype, designated here). EPITYPE: Colombia. Valle: Cauca Valley, Zarzal, 970–1050 m, 21 July 1922, *F. W. Pennel, E. P. Killip & T. E. Hazen 8403* (epitype designated here, AMES, NY). [The holotype, *M. Madero s.n.*, for *Camaridium equitans* was destroyed at B.]

Camaridium vandiforme Schlechter, Beih. Bot. Centralbl. 42: 174. 1925. *Maxillaria vandiformis* (Schlechter) C. Schweinfurth, Bot. Mus. Leafl. 11: 291. 1945. TYPE: Peru. Loreto: vicinity of Iquitos, 100 m, dense forest, on living tree, Jan.–Feb. 1937, *G. Klug 10076* (lectotype, designated here, AMES). [Syntypes by *G. Hübner* (*120, 124, 149*) were destroyed at B.]

Maxillaria matogrossensis Brade, Arq. Serv. Florest. 1: 46, t. 3, Fig. 1–8. 1939. *Marsupiaria matogrossensis* (Brade) Hoehne, Arq. Bot. Estado de São Paulo N.S., Formato Maior 2: 71. 1947. TYPE: Brazil. "Mato Grosso": ex Hort. Jardim Botânico Rio de Janeiro, 11 June 1939, *Inspectoria Agricola Federal da VIII Região Mato Grosso V.14.399* (holotype, RB not seen).

Heterotaxis maleolens (Schlechter) Ojeda & Carnevali, comb. nov. Basionym: *Maxillaria maleolens* Schlechter, Repert. Spec. Nov. Regni Veg. Beih. 19: 233. 1933. TYPE: Costa Rica. Alajuela: Río Jesús de San Ramón, 800 m, 10º02'N, 84º31'W, June 1922, *A. M. Brenes 281* (lectotype designated by Barringer, Fieldiana, Bot. n.s., 17: 10. 1986, CR-25985). [The holotype of *Maxillaria maleolens* at B was destroyed, and Barringer designated the only known isotype as the lectotype.]

Heterotaxis microiridifolia (D. E. Bennett & Christenson) Ojeda & Carnevali, comb. nov. Basionym: *Maxillaria micro-iridifolia* D. E. Bennett & Christenson. Icones Orchidacearum Peruvianum. Plate 699. 2001. TYPE: Peru. Puno: Sandia, Candamo river valley, 550 m, 15 Sep. 1998, *M. Cavero B. ex D. B. Bennett 7823* (holotype, Herb. Bennettianum, Lima, Peru; isotype, NY).

Heterotaxis santanae (Carnevali & I. Ramírez) Ojeda & Carnevali, comb. nov. Basionym: *Maxillaria santanae* Carnevali & I. Ramírez, Ann. Missouri Bot. Gard. 76: 377. 1989. TYPE: Venezuela. Amazonas: Atabapo, Cerro Marahuaca, 11 Nov. 1986, *G. Santana 1* (holotype, VEN; isotype, MO).

Heterotaxis valenzuelana (A. Richard) Ojeda & Carnevali, comb. nov. Basionym: *Pleurothallis valenzuelana* A. Richard, Sagra, Hist. Fis. Cuba 11: 234. 1850. *Maxillaria valenzuelana* (A Richard) Nash, Bull. Torrey Bot. Club 34(3): 121–122. 1907. *Marsupiaria valenzuelana* (A. Richard) Garay, Arq. Jard. Bot. Rio de Janeiro 12: 183. 1952. TYPE: Cuba. Valenzuela, *C. Wright 3314* (holotype, P not seen).

Maxillaria iridifolia Bateman ex Reichenbach f., Bonplandia 2: 16. 1854. *Marsupiaria iridifolia* (Bateman ex Reichenbach f.) Hoehne, Arq. Bot. Est. São Paulo 2: 71. 1947. TYPE: Cuba. without precise locality, "Wächst bei Cohubas," *E. F. Poeppig s.n.* (holotype, H.G. Reichenbach f. Hb., W not seen).

Dicrypta irisphyta Barbosa Rodrigues, Gen. et Sp. Orch. Nov. 1: 126. 1877. TYPE: watercolor in *Iconographie des Orchidées du Brésil*, Vol. 6: t. 292 (fide Barbosa Rodrigues 1996: 420; "Tab. 487" fide Barbosa Rodrigues 1877: 126) RB [Library] (lectotype, designated here; reproduced in Barbosa Rodrigues, 1996, 1: 420). [The holotype (*J. Barbosa-Rodrigues s.n.*) of *Dicrypta irisphyta* was probably destroyed at Barbosa Rodrigues' home in Rio de Janeiro, according to P. Cribb & A. Toscano de Brito in Barbosa Rodrigues, 1996: 30–31.]

Maxillaria valenzuelana subsp. *angustata* J. T. Atwood, Icon. Pl. Trop. 1371. 1989. Syn. nov. *Maxillaria valenzuelana* var. *angustata* (J. T. Atwood) Senghas, Schlechter, Orchideen ed. 3, I/B (29): 1779. 1994. TYPE: Nicaragua. Zalaya, Siuna, *F. Ortiz 612* (holotype, SEL).

As stated by Atwood in the protologue, *Maxillaria valenzuelana* subsp. *angustata* differs from the type only in the ". . .generally smaller [size of]. . .all its parts, and the scapes and flowers [that] are more exposed." We have seen a great deal of material of this species. The variation we detected along its geographical range and within populations is considerable: we hypothesize that *M. valenzuelana* subsp. *angustata* is well encompassed within this range of size and morphological variation.

Acknowledgments. This publication is the partial result of the research conducted by the first author in the course of his M.Sc. degree in Systematic Botany. These studies were conducted within the "Mención en Ecología del Posgrado en Ciencias y Biotecnología de Plantas del Centro de Investigación Científica de Yucatán." The first author acknowledges a scholarship by CONACyT that supported his graduate work. The authors thank the curators of the herbaria that loaned us material for this study or that allowed us to study their herbarium specimens and living accessions. These are primarily: AMO, F, FLAS, MEXU, NY, SEL, and US, although materials from other institutions were consulted during the course of this research. Norris H. Williams and Mark Whitten (Herbarium FLAS, Florida Museum of Natural History, University of Florida) contributed in several ways, particularly with the access to their laboratory facilities and their assistance with technical and theoretical aspects related to this research, besides contributing their knowledge on the Orchidaceae in general and of the Maxillariinae in particular. Mark Whitten also contributed first-hand information on the morphology of *Heterotaxis fritzii* and allowed us to use his photographs. Victoria Sosa (Herbarium XAL, Instituto de Ecología, Xalapa) contributed her knowledge of phylogenetic matters and of the Orchidaceae in general. Robert L. Dressler provided discussion and miscellaneous information for which we are enormously grateful. Ivón M. Ramírez (CICY) carefully read and commented on an earlier draft of this paper. We are grateful to the staff of CICY for handling and databasing of the specimens studied in the course of this research, particularly Lilia Can, Silvia Hernandez, Filogonio May Pat, and Jose Luis Tapia. Kanchi Gandhi (HUH) provided invaluable help with the intricacies of orchid nomenclature.

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A New Species of *Croton* sect. *Luntia* (Euphorbiaceae) from Western Amazonian Brazil

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ABSTRACT. A new species of *Croton*, *C. subasperrimus*, is described and illustrated from a previously unexplored area of Amazonas State, Brazil. It belongs to *Croton* sect. *Luntia* subsect. *Cuneati* because of its pinnate leaf venation, slightly reduplicate pistillate calyx, partially bisexual basal cymules, presence of lepidote trichomes, low stamen number, and multifid stigmas. It differs from related species in its stellate-lepidote trichomes that sometimes have tall porrect central rays and in its smaller, concolorous leaves with an obtuse base and stipitate glands along the margins.

Key words: Amazonia, Brazil, *Croton*, Euphorbiaceae, section *Luntia*.

Croton L. is the second largest genus of Euphorbiaceae, with over 1200 species distributed across the tropics, and it is most densely distributed in the West Indies and in Central and South America (Webster, 1994; Govaerts et al., 2000). The genus includes trees, shrubs, herbs, and lianas, and plants are generally monoecious or occasionally dioecious, with various kinds of stellate and lepidote trichomes. The inflorescences usually have the pistillate flowers positioned basally and the staminate ones apically, with the anthers inflexed in bud and the female petals generally reduced or absent. The Brazilian species have not been revised taxonomically since the treatment by Mueller (1873) in *Flora Brasiliensis*, although many individual taxa have been described since then. Recent treatments on South American *Croton* such as those of Cordeiro (1992), Secco (1992), Murillo (1999), and Webster et al. (1999) are still insufficient to determine all the species of Neotropical *Croton*. In the three large herbaria of Amazonian Brazil (IAN, INPA, MG), there are still many unidentified or misidentified specimens of *Croton*, and many of these cannot be matched to any currently described species.

The species described and illustrated below is a distinctive one that was recently collected on a helicopter trip to a remote and very poorly collected area of western Amazonian Brazil.

Croton subasperrimus Secco, P. E. Berry & Rosário, sp. nov. TYPE: Brazil. Amazonas: mun. Canutama, rio Mucuim, margem direita do rio Purus, fazenda Morada do Sol, 22 Nov. 2000 (fl, fr), *C. S. Rosário & A. S. L. Silva PO3–7–3559* (holotype, MG; isotypes, INPA, MO, RB, WIS). Figure 1.

Frutex monoicus, ramis dense trichomatibus lepidotis obtectis. Folia venatione pinnata, marginibus crenatis, basi glandularumpares instructa, supra sparse pubescentia, infra dense pubescentia. Inflorescentiae in thyrsis racemoideis terminalibus, cymulis inferioribus saepe bisexualibus. Flores staminati pedicellati, pedicellis trichomatibus stellato dendriticis obsitis. Flores pistillati breviter pedicellati, petalis 5 reductis vel obsoletis. Fructus dense lepidoto indumento obtecti. Ab *C. subcoriaceo* foliis minoribus concoloribus apicis acuminati et glandulis stipitatis marginalibus differt.

Shrub 1.5–2 m tall; stems densely covered by lepidote or stellate-lepidote, asperous trichomes. Leaves chartaceous, alternate, 4–10.5 × 1.5–4 cm, pinnately veined, elliptic to elliptic-lanceolate, with lepidote to stellate-lepidote trichomes (sometimes the trichomes with a central porrect ray 0.5–0.6 mm tall), the adaxial side sparsely pubescent, with trichomes concentrated along the midvein, the abaxial side more densely pubescent (especially when young), apex acuminate, base obtuse, margin slightly crenate and with small stipitate cylindrical glands ca. 0.3 mm diam. and 0.2–0.3 mm long, spaced 3–8 mm apart along the margin; petiole 4–10 mm long, densely covered by ferrugineous indument, with a conspicuous pair of saucer-shaped glands 1–1.3 mm diam. at the apex on the adaxial to medial side, occasionally with a smaller pair of glands distal to the larger pair; stipules deciduous. Inflorescence a terminal, raceme-like thyrse 9–17.5 cm long, the rachis densely covered by stellate-lepidote trichomes, the male flowers distally grouped in fascicles of 3 to 5, the female flowers

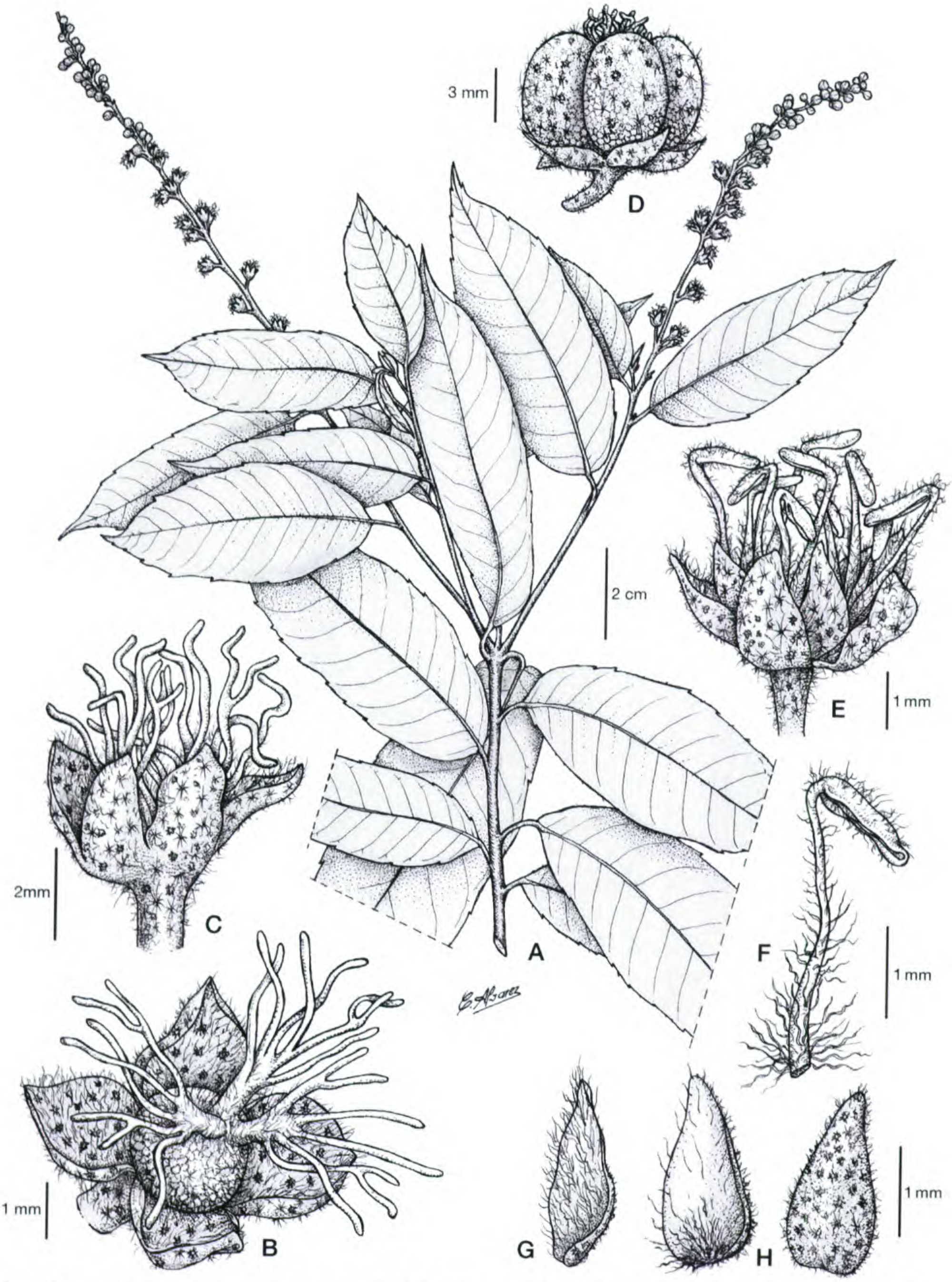

Figure 1. *Croton subasperrimus* Secco, P. E. Berry & Rosário. —A. Branch with inflorescences showing distal staminate flowers and proximal pistillate ones. —B. Pistillate flower, with one calyx lobe removed to show the ovary. —C. Pistillate flower, lateral view. —D. Fruit. —E. Staminate flower. —F. Stamen. —G. Staminate petal, internal side shown. —H. Staminate sepals, internal and external surfaces shown. Drawn from the holotype, *Rosario & Silva PO3-7-3559*.

basal and solitary or sometimes in cymules with subtending male flowers. Staminate flowers with a slender pedicel 1–2 mm long, covered by stellate-dendritic trichomes; sepals 5, valvate to partly free in bud, elliptic-lanceolate, 2–3 mm long, externally with a dense indument of stellate-lepidote trichomes, internally with a sparse indument of villose trichomes; petals 5, elliptic-lanceolate, 1.5–2.5 mm long, covered on the inside by villose trichomes, especially along the margins and internally near the base; stamens 10 to 11, the filaments filiform and 3–4 mm long, densely covered by villose trichomes,

the anthers basifixed, elongate, deflexed from the apex of the filament, 1.2–1.6 mm long × 0.4 mm wide, dorsally pubescent. Pistillate flowers with a thick pedicel 2–3 mm long densely covered by stellate-lepidote trichomes; calyx 5-lobed, slightly reduplicate in bud, the lobes 3–3.5 mm long, elliptic to lance-elliptic, densely stellate-lepidote on both surfaces; petals 5, nearly obsolete, 1–1.5 mm long, formed by tufts of stellate trichomes; ovary globose, ca. 2.5 mm diam., densely stellate-lepidote; styles 3, each branched up to 5 times, the branches 3–4 mm long, rugose, with lepidote trichomes at the base, glabrous from the middle to the apex. Fruit a capsule ca. 8 mm diam., densely lepidote, mericarps 3(4); seeds not seen.

Habitat and distribution. Known only from the type locality, in a remote and poorly collected region of western Amazonian Brazil, along a tributary of the rio Purus in Amazonas State. It is apparently a riverine species, probably subject to seasonal flooding.

Etymology. The specific epithet refers to the somewhat asperous feel of the leaves due to the stiff trichomes on the lower surface.

By virtue of the mostly lepidote trichomes, pinnate, subentire leaves with basal glands, stamens 10 or 11, and pistillate flowers with pedicels shorter than the calyx, and multifid stigmas, *Croton subasperrimus* most closely fits the definition of *Croton* sect. *Luntia* (Rafinesque) G. L. Webster subsect. *Cuneati* G. L. Webster, as defined in the sectional synopsis of Webster (1993). This section contains about ten species that occur mainly in the Amazon region and in the Guiana Shield. Both *C. subcoriaceus* Jablonski and *C. cuneatus* Klotzsch belong in the same subsection and can have similarly crenate leaves. Another as yet undescribed species from southern Amazonia apparently belongs to this subsection as well and has the same kind of stipitate glands along the leaf margins as our new species does. *Croton subasperrimus* most closely resembles *C. subcoriaceus*, but it differs from that species by the smaller, concolorous leaves with an acuminate apex and obtuse base, the margin crenate and with stipitate glands, and fewer stamens. The widespread *C. cuneatus* in the same subsection differs in its leaves with a denser covering of smaller lepidote trichomes on the abaxial side, a cuneate base, and more numerous stamens.

Acknowledgments. The senior author wishes to thank the Brazilian CNPq for their financial support of this work (Project N° 301.252/86–6). William A. Rodrigues, from the Universidade Federal do Paraná, Brazil, assisted us with the Latin diagnosis, and Carlos A. Alvarez made the illustration of the new taxon.

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Plinia nana (Myrtaceae), a New Species from Minas Gerais, Brazil

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Abstract. *Plinia nana* (Myrtaceae), a new species from the campos cerrados of the Brazilian state of Minas Gerais, is described, illustrated, and compared with the related *Plinia cauliflora* (Martius) Kausel, from which it is set apart by the shrubby habit and sessile cordate leaves.

Resumo. *Plinia nana* (Myrtaceae), uma nova espécie dos campos cerrados de Minas Gerais, Brasil, é descrita, ilustrada e comparada com *Plinia cauliflora* (Martius) Kausel, da qual se distingue principalmente pelo hábito arbustivo e pelas folhas sésseis e cordadas.

Key words: Brazil, Myrtaceae, *Plinia*.

The American genus *Plinia* extends from Antilles to Uruguay and comprises about 30 species (Landrum & Kawasaki, 1997), although this estimate does not include some eastern Brazilian tree species commonly known as "jaboticabas," widely cultivated for their edible fruits, as for example *Pli-*

Figure 1. *Plinia nana*. Scanned image of isotype at MO (*Hatschbach et al. 69578*).

Figure 2. *Plinia nana*. Branch (*Alves & Sobral 168*).

nia cauliflora (Martius) Kausel, *P. jaboticaba* (Vellozo) Kausel, *P. trunciflora* (O. Berg) Kausel (Kausel, 1956), *P. phitrantha* (Kiaerskou) Sobral, and *P. grandifolia* (Mattos) Sobral (Sobral, 1994). These jaboticaba species are generally assigned to *Myrciaria* O. Berg (Berg, 1855–1856, 1857–1859), but Kausel (1956) proposed their inclusion in the genus *Plinia* due mainly to their seeds with separate plano-convex cotyledons rather than the fused ones of *Myrciaria*. This last genus is characterized mainly by fused bracteoles, a calyx-tube deciduous at anthesis, and seeds with generally fused cotyledons, while *Plinia* presents distinct bracteoles, a persistent calyx-tube, and seeds with separate, plano-convex cotyledons. Such limits unfortunately are not clear; some *Myrciaria* present plano-convex cotyledons and some *Plinia* may have a tardily deciduous calyx-tube. Considering such characters, assigning some species to one genus or the other may be a matter of taxonomic opinion. Since jaboticabas encompass character states also found in *Plinia*, I currently prefer to include them in *Plinia*.

During a floristic inventory of the campos cerrados and campos rupestres of central Minas Gerais, a shrubby species of jaboticaba was collected and is herein described as new.

Plinia nana Sobral, sp. nov. TYPE: Brazil. Minas Gerais: Diamantina, rod. BR-367, km 711, 23 Oct. 1999, *G. Hatschbach, R. Spichiger, A. C. Cervi & E. Barbosa 69578* (holotype, MBM; isotype, MO). Figures 1–3.

Species haec *Plinae cauliflorae* proxima, a qua habitu suffruticoso et foliis sessilis cordatisque recedit.

Shrub 0.5–1.5 m; plants glabrous except for scattered trichomes on the flowers; cortex smooth, exfoliating; young twigs smooth, gray or sometimes

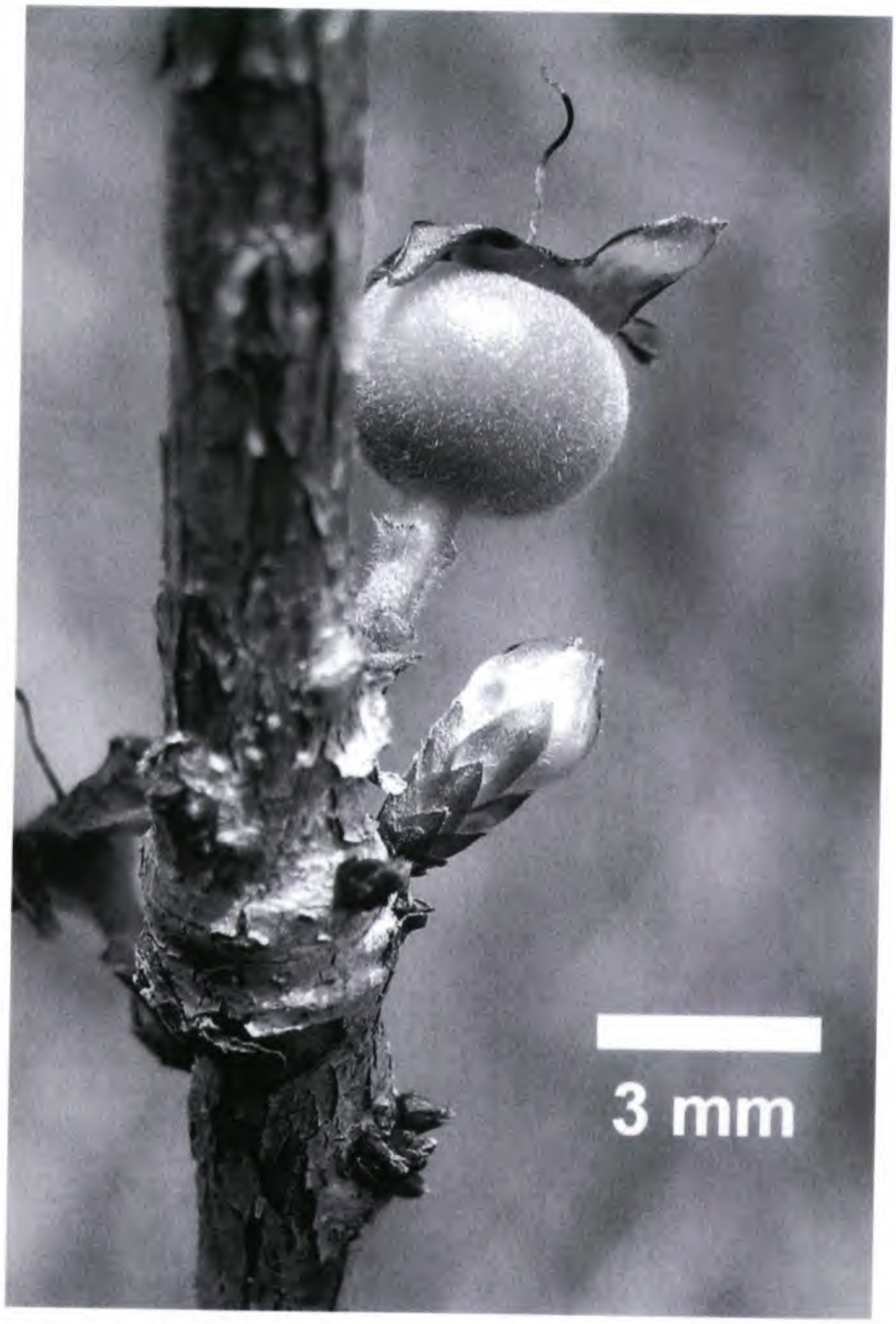

Figure 3. *Plinia nana*. Flower bud, old flower and immature fruit (*Alves & Sobral 167*). Scale bar 3 mm.

markedly reddened in living material. Leaves sessile or subsessile; petioles absent or to 1 × 1 mm; blades cordate, 24–50 × 15–40 mm, decussate, slightly discolored or concolorous; apex acuminate or mucronate; base cordate; midvein sulcate adaxially and markedly salient abaxially; secondary veins 8 to 15 pairs, visible on both faces and salient at least abaxially; marginal vein formed by the arches of the secondary veins, somewhat discontinuous, 2–2.5 mm from the margin, occasionally a second vein 0.5–1 mm from the margin visible, the margin itself slightly revolute; petioles absent or to 1 × 1–2 mm. Inflorescences ramiflorous, uniflorous (occasionally two or three arising from the same place and apparently 2- to 3-florous), the fertile axis 1–2 × 0.5 mm, with up to 5 series of bracts distally increasing in size, the proximal ones elliptic, 0.8–1 × 1–1.2 mm and the distal ones lanceolate, 3–3.5 × 2–2.5 mm; pedicels absent in flowers or to 1 × 0.7 mm, elongated in fruits to 1–4 × 0.7–0.8 mm; bracteoles elliptic-lanceolate, to 2 × 1 mm; buds elliptic to pyriform, white, 4–5 × 3–4 mm, the ovaries with scattered gray trichomes 0.1 mm; calyx-lobes 4, well defined in bud but the staminal ring and calyx-tube tearing open outside at anthesis, elliptic-lanceolate to triangular-lanceolate, 2–3 × 2.2–2.5 mm; petals 4, orbicular, white, 5 × 4–5 mm; stamens 100 to 120, 3–4 mm, the anthers elliptic, 0.4 × 0.2 mm, without apical glands; calyx-tube about 1 mm; style to 5 mm, stigma punctiform; ovary bilocular with 2 centrally attached ovules per locule. Fruits globose, purple to black when ripe, to 20 mm diam., glabrous or sometimes softly puberulent, crowned by the persistent and somewhat enlarged calyx-lobes (to 4 × 3 mm); seeds reniform, 5–6 × 4 mm, with membranous testa and discrete, plano-convex cotyledons, without evident hypocotyl.

Affinities. This species is related to *Plinia cauliflora* (Martius) Kausel, from which it can be distinguished by the following characters:

1a. Treelet or tree to 10 m high, inhabiting forests; leaves evidently petiolate, the petioles 3 × 0.5 mm; blades membranous, with 2 well-defined marginal veins and an acute to obtuse base . . . . . *Plinia cauliflora*

1b. Shrub to 1.5 m high from campos cerrados; leaves sessile or with petioles, when present, to 1 × 1 mm; blade chartaceous, with 1 (rarely 2) marginal vein, this occasionally discontinuous, and cordate base . . . . . *Plinia nana*

Habitat and distribution. *Plinia nana* was collected in campos cerrados and campos rupestres at the municipalities of Diamantina, Felício dos Santos, Itacambira, and São Gonçalo do Rio Preto in central Minas Gerais.

Phenology. Flowers were collected in August and October and fruits in October and November; according to collectors, ripe fruits have a very sweet taste.

Etymology. The epithet *nana*, from the Latin word for dwarf, alludes to the small size of the species. It is noteworthy that no shrubby species of jaboticaba was known until now.

Paratypes. BRAZIL. **Minas Gerais:** Felício dos Santos, 8 Aug. 2004, *P. Viana & N. Mota 1856* (BHCB). Itacambira: 30 Nov. 1984, *R. Harley et al. (SPF 36241)*, 13 Nov. 2001, *A. Tozzi & M. Alencar 2001–480* (UEC); 17°10′02″S, 43°07′00″W, 9 Nov. 2002, *F. Mazine et al. 662* (BHCB, ESA). São Gonçalo do Rio Preto: Parque Est. Rio Preto, Ribeirão das Éguas, 18 Nov. 1999, *J. Lombardi 2548* (BHCB); Poço dos Veados, 18 Oct. 2000, *J. Lombardi 4084* (BHCB); 3 Oct. 2003, *P. Viana et al. 1243* (BHCB); 15 Oct. 2003, *T. Alves & M. Sobral 167* (BHCB).

Acknowledgments. Thanks to Gert Hatschbach (MBM) and Fiorella Mazine (ESA) for sending me duplicates of their collections; to Júlio Lombardi (HRCB) and Pedro Viana (BHCB) for their kind help and discussions; to the staff of the Rio Preto State Park for their gracious cooperation; and to Victoria Hollowell and an anonymous reviewer for valuable suggestions on this paper.

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Las Especies del Género *Lonchocarpus* sect. *Lonchocarpus* (Leguminosae, Papilionoideae: Millettieae) para Bolivia

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Resumen. Se hace una relación de las especies de *Lonchocarpus* sect. *Lonchocarpus* para Bolivia. De las cinco especies conocidas, cuatro resultaron nuevas para la ciencia. Se describen, ilustran y mapean *Lonchocarpus lomentaceus*, *L. neei*, *L. riparius* y *L. sericophyllus*, todas ellas endémicas a Bolivia. Las cinco especies de la sect. *Lonchocarpus* se contrastan en una clave dicotómica.

Abstract. An account of section *Lonchocarpus* of the genus *Lonchocarpus* for Bolivia is given. Of the five species found, four were new to science, all of them endemic to Bolivia, *Lonchocarpus lomentaceus*, *L. neei*, *L. riparius*, and *L. sericophyllus* are described, illustrated, and mapped. A key to distinguish the species of section *Lonchocarpus* is provided.

Key words: Bolivia, Leguminosae, *Lonchocarpus*, sect. *Lonchocarpus*.

El género *Lonchocarpus* Kunth (Fabaceae: Millettieae) comprende alrededor de 140 especies neotropicales y una especie, *Lonchocarpus sericeus* (Poiret) Kunth ex DC., extiende su distribución en la costa occidental de África ecuatorial. La sect. *Lonchocarpus* consta de alrededor de 27 especies, es la mejor representada en Sudamérica con 15 especies, y de ellas 12 endémicas; en México y Centro América se cuentan con 13 spp., de ellas 9 son endémicas; y de las cuatro de Las Antillas dos son endémicas; una especie está representada en África.

Lonchocarpus sect. *Lonchocarpus*: *Lonchocarpus sericeus* (Poiret) Kunth ex DC. (typus conservandus)

La sect. *Lonchocarpus* se caracteriza por: corteza interior generalmente exuda resina rojiza al corte; folíolos generalmente con el ápice acuminado; flores con bractéolas grandes, redondeadas, aplicadas y frecuentemente cubriendo la base del cáliz; cáliz trunco o casi trunco; pétalos en general densamente canescente seríceos adaxialmente; el estandarte abaxialmente canescente pilósulo en el centro de la base hasta generalmente el tercio inferior de la lámina, así como la uña (particularmente en las especies de Sudamérica); mecanismo floral fuertemente explosivo; legumbre indehiscente, la sutura vexilar generalmente ensanchada; plántulas con los cotiledones epígeos, eofilos opuestos, simples.

En este artículo se describen como nuevas a cuatro de las cinco especies de esta sección para Bolivia.

En Bolivia, además de las especies de la sect. *Lonchocarpus* existen *Lonchocarpus hedyosmus* Miquel, miembro del grupo con ese mismo nombre, y *L. angulatus* Ducke, *L. densiflorus* Bentham y *L. negrensis* Bentham, tres especies que Azevedo-Tozzi (1989) propone deberían ser transferidas a *Deguelia* Aublet. Si bien recientemente *Muellera fluvialis* (Lindman) Burkart fue transferida a *Lonchocarpus* (Fortunato y Palese, 1997) esta es una decisión taxonómica que no comparto. Es más, *L. nudiflorum* Burkart, otra especie que también se encuentra en Bolivia, debería pasar a *Muellera* L.f., pero en el presente artículo no tengo la intención formal de hacerlo. Sin embargo, existen caracteres que están en las yemas vegetativas, en las inflorescencias y en las flores que sustentan a *Muellera* como género aparte de *Lonchocarpus*.

Lonchocarpus lomentaceus M. Sousa, sp. nov. TIPO: Bolivia. Dept. Beni: Prov. Vaca Diez, ca. 5 km SW of Riberalta, heavily disturbed flood plain forest, annually inundated, 11°02′S, 66°07′W, alt. 220 m, 3 June 1982, *J. C. Solomon 7939* (holotipo, MEXU; isotipos, MO, MEXU). Figuras 1, 2.

Frutex ca. 3 m altus, glaber; folia 5(7)-foliolata, foliolis ellipticis, epunctatis. Inflorescentiae 7–11.5 cm longae, axillares. Legumen lomentaceum, curvatum vel arcuatum, 3.5–9.5 cm longum, 1.2–1.4 cm latum, sublignosum, oblongum vel lineare, 1 ad 6-seminale, inter semina supra suturam carinalem et valvas constrictum, ubi septis in articulis uniseminalibus legumen frangentibus, sutura vexillari ad 3 mm lata, sulcata, duobus marginibus crassis limitata.

Arbustos ca. 3 m alto; corteza interior con algo de fluido resinoso al corte; ramas teretes, acostilladas, sólidas, glabrescentes, con lenticelas orbiculares a

Figura 1. *Lonchocarpus lomentaceus* M. Sousa. —A. Rama con hojas, infrutescencias y legumbres. —B. Legumbre mostrando el margen vexilar. (A, B, *J. C. Solomon 7939*.)

elípticas; estípulas caducas, no vistas; pecíolo 2.8–3.5 cm largo; raquis foliar 3–5 cm largo, marcadamente canaliculado, glabro; hojas 5(7)-folioladas; foliolos (4–)5.5–9.5 cm largo, (2.5–)3–5 cm ancho, elípticos, cartáceos a subcoriáceos, epunteados, pero con las nervaduras de 3° y 4° orden translúcidas, la base cuneada, el ápice acuminado, el haz y el envés glabrescentes a glabros; nervación camptódroma, nervaduras primaria y secundarias ligeramente realzadas en el envés, nervaduras laterales 7 a 9. Infru-

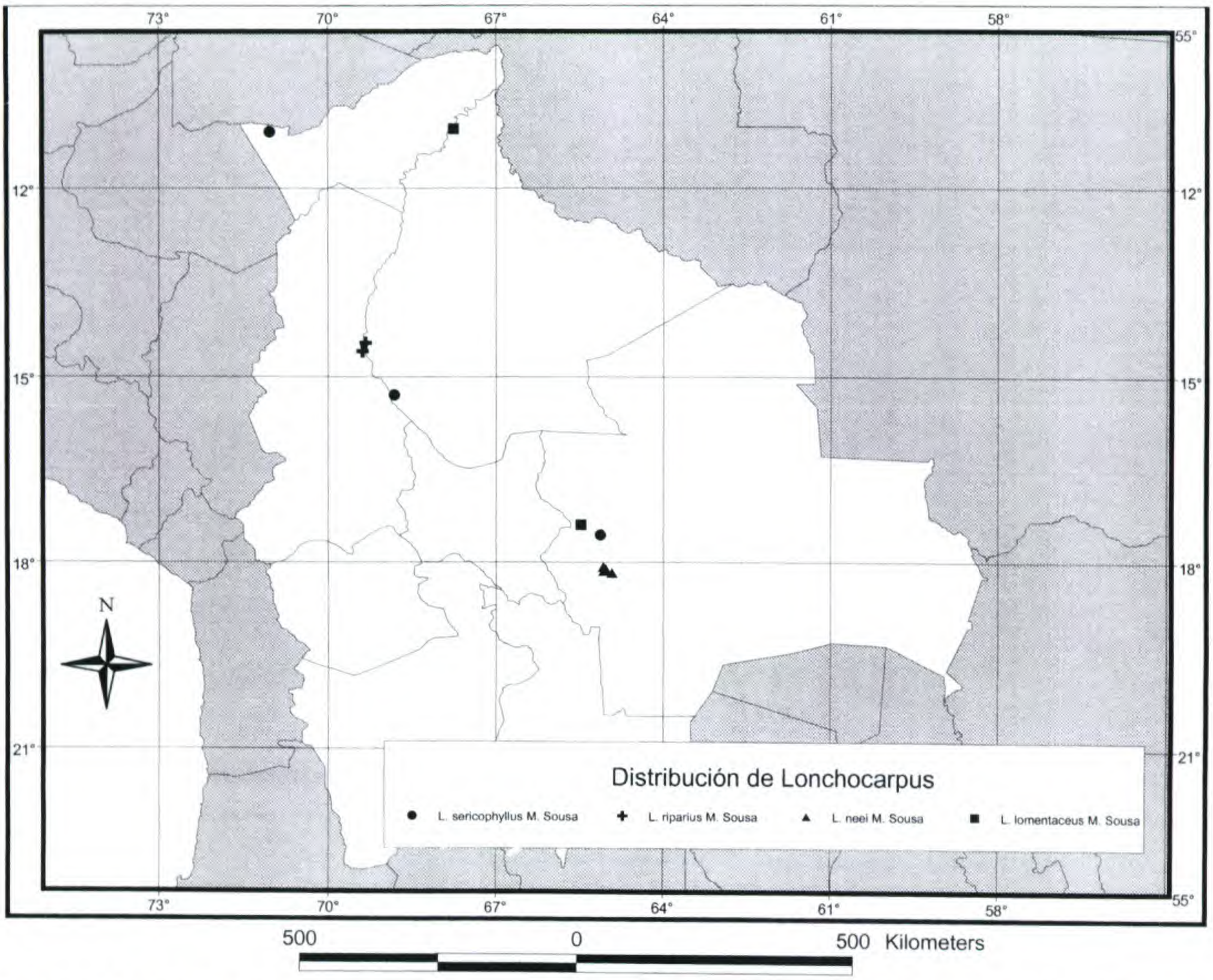

Figura 2. Mapa de Bolivia con la distribución espacial de *Lonchocarpus lomentaceus* M. Sousa (■), *L. neei* M. Sousa (▲), *L. riparius* M. Sousa (+), *L. sericophyllus* M. Sousa (●).

tescencias 7–11.5 cm largo, axilares, cortamente pedunculadas; floración desconocida; pedúnculos fructíferos 1.3–2 mm largo; pedicelos fructíferos 2–3 mm largo; bractéolas persistentes, opuestas, aplicadas al cáliz, orbiculares, 0.9–1 mm largo, 0.9–1 mm ancho. Flores desconocidas; cáliz (presente en el fruto) ciatiforme, 2.9–3.1 mm largo, ca. 3 mm ancho, canescente seríceo, epunteado, corola desconocida. Legumbre lomentácea, marcadamente curvada a arqueada, algo aplanada, 3.5–9.5 cm largo, 1.2–1.4 cm ancho, subleñosa, oblonga a linear, con 1 a 6 semillas, glabra, constricta entre las semillas sobre la sutura carinal y valvas, presentando septos que fragmentan a la legumbre en artículos monospermos, la base atenuada a largamente atenuada, el ápice rostrado, la sutura vexilar hasta 3 mm ancho, surcada y bordeada de 2 márgenes gruesos de 1–2 mm ancho, la sutura carinal aquillada. Semillas inmaduras.

Distribución y hábitat. Conocida solamente de la colección tipo del Dept. Beni, Provincia Vaca Diez. En planicies selváticas alteradas, inundables anualmente.

Fenología. Con frutos casi maduros a principio de junio.

El epíteto se refiere a la muy particular legumbre lomentácea de esta especie.

Esta especie es descrita como una novedad por no existir representantes con legumbre lomentácea entre las especies bifloras y arbóreas del género *Lonchocarpus*. Cabe destacar que en el grupo de especies de bejucos leñosos, propuestas como *Deguelia* por Azevedo-Tozzi (op. cit.), *Lonchocarpus densiflorus* Bentham presenta una legumbre similar.

Lonchocarpus neei M. Sousa, sp. nov. TIPO: Bolivia. Dept. Santa Cruz: Prov. Florida, 3 km SW of Angostura, gorge of Río Piraí, along small side stream on N side of canyon and highway; disturbed areas of subtropical semideciduous forest, 18°10′S, 63°33′W, alt. 700 m, 27 Dic. 1992, *M. Nee 43376 & I. Vargas C.* (holotipo, MEXU; isotipos, NY, USZ). Figuras 2, 3.

Figura 3. *Lonchocarpus neei* M. Sousa. —A. Rama con hojas e inflorescencias. —B. Cáliz con pedicelo y bractéolas. —C. Estandarte. —D. Ala. —E. Pétalos de la quilla. —F. Tubo estaminal. —G. Gineceo. —H. Infrutescencia, mostrando a las legumbres en diferentes caras. (A–G, *M. Nee 43376* e *I. Vargas*; H, *I. G. Vargas C. 5083*.)

Arbor 7–20 m alta. Rami brunneo-flavidi, velutini vel glabrescentes. Folia 5 ad 7-foliolata, foliolis translucido-punctatis. Inflorescentiae (4–)6–9 cm longae, longipedunculatae, floribus 11–12 mm longis; petalis roseo-violaceis. Legumen 6–7(–13) cm longum, coriaceum vel sublignosum, dense velutino-ferrugineum vel brunneo-flavidum, base attenuata; sutura vexillari ad 4 mm lata, sulcata, per duo margines angustos marginata.

Árboles 7–20 m de alto; corteza interior con fluido resinoso al corte; ramas teretes, ligeramente acostilladas, sólidas, de moderadamente pardo-amarillento velutinas a glabrescentes, con lenticelas elípticas a largamente elípticas; estípulas pronto caducas, 0.9–1.1 mm largo, 1–1.1 mm ancho, orbiculares transversalmente elípticas; pecíolo 2.8–3.6 cm largo; raquis foliar 3–6.7 cm largo, marcadamente canaliculado, velutino como las ramas; hojas 5 a 7-folioladas; foliolos 4.5–8 cm largo, (1.7–)2–4 cm ancho, elípticos en ocasiones lanceolados, cartáceos a subcoriáceos, translúcido punteados, la base cuneada a redondeada, el ápice acuminado a caudado, el haz y el envés de moderada a esparcidamente velutinos, glabrescentes; nervación camptódroma, nervadura primaria y secundarias ligeramente realzadas en el envés, nervaduras laterales 6 a 8(a 10). Inflorescencias (4–)6–9 cm largo, axilares, largamente pedunculadas; floración tardía; pedúnculos florales 2–2.5 mm largo, delgados, espaciados; pedicelos 2.5–3 mm largo; bractéolas opuestas, aplicadas al cáliz, orbiculares a ligulares, 0.9–1.1 mm largo, 1–1.1 mm ancho. Flores 11–12 mm largo; cáliz ciatiforme, casi trunco, 3–4 mm largo, 4–5 mm ancho, pardo-amarillento seríceo, translúcido punteado; corola rosado-violáceo, translúcido punteada, todos los pétalos canescente seríceos; estandarte reflexo, su lámina orbicular a transversalmente elíptica, 10–12 mm ancho; ovario densamente seríceo. Legumbre, recta, aplanada, 6–7(–13) cm largo, 2–3.1 cm ancho, coriácea a subleñosa, elíptica a oblonga, con 1 a 3 semillas, densamente ferrugínea a pardo-amarillento velutina, constricta entre la semillas sobre las suturas, la base atenuada a largamente atenuada, el ápice apiculado a rostrado, la sutura vexilar hasta 4 mm ancho, surcada y bordeada de 2 márgenes angostos de 1.6–1.8 mm ancho, la sutura carinal aquillada. Semillas reniformes, pardo-amarillentas, ca. 19 mm largo, ca. 13 mm ancho, ca. 3.8 mm grueso.

Distribución y hábitat. Sólo se conoce de las estribaciones continentales de Los Andes, en la Prov. Florida, en el Dept. de Santa Cruz. Crece en hábitats riparios, con *Vitex cymosa* Bertero ex Sprengel, *Licaria* Aublet, *Sapindus saponaria* L. en vegetación secundaria de selvas subcaducifolias subtropicales, y en selvas caducifolias en pendientes, a elevaciones de 700 a 1150 m.

Fenología. Se ha colectado en botones florales a principios de noviembre, en plena floración a finales de diciembre, y en fructificación a finales de mayo y principios de agosto.

Esta especie se dedica a Michael Nee (1947–) amigo y gran botánico conocedor de la flora de México y Bolivia, y reconocido especialista en la familia de las Solanaceae, quien actualmente se encuentra realizando la Flora de la Región del Parque Nacional Amboró, en Bolivia.

De las especies de la sect. *Lonchocarpus* en Bolivia, ésta es la que tiene las flores más grandes y los pétalos de color rosado-violeta a diferencia de las otras, con flores chicas y blancas o de color crema; sus legumbres son característicamente ferrúgineo a pardo-amarillento velutinas.

Paratipos. BOLIVIA. Dept. Santa Cruz. Prov. Florida. 88 km SW of Santa Cruz on road to Samaipata, 18°08′S, 63°41′W, atl. 1000 m, *A. Lawrence & I. Vargas 11* (USZ); Vic. "Puente Las Cruces" along highway from Santa Cruz to Samaipata, 6 km W (by air) of Bermejo, along Río Vicoquín, 18°08′S, 63°41′W, alt. 1000 m, *M. Nee 42197* (MEXU, NY, USZ); 17 km by dirt road S of turn off from Bermejo–Samaipata highway, slopes above Quebrada La Coca, 18°09′S, 63°41′30″W, alt. 1150 m, *M. Nee 50509* (MEXU, NY); Volcanes, cerca de 6 km NE de Bermejo, 18°06′S, 63°39′W, alt. 990 m, *M. Saldias 4746* (MEXU, NY, USZ); Volcanes, 3 km al N de Bermejo, subiendo por márgenes del Río Colorado, 18°06′S, 63°39′W, alt. ca. 1000 m, *I. G. Vargas C. 5083* (MEXU, NY, USZ).

Lonchocarpus pluvialis Rusby, Mem. New York Bot. Gard. 7(3): 268. 1927. TIPO: Bolivia. Road from Rurrenabaque to Reyes, *O. E. White & H. H. Rusby 1302* (holotipo, NY; isotipos, GH!, US!). *Vouacapoua pluvialis* Rusby, nom. nud. Trop. Woods 6: 12. 1926.

Lonchocarpus sericeus (Poiret) D.C. subsp. *paraguariensis* Hassler, Feddes Repert. Spec. Nov. Regni Veg. 8: 207. 1910. TIPO: Paraguay. Río Apa: *K. Fiebrig 4389* (holotipo, G!; isotipo, GH!).

Derris steinbachii Harms, Notizbl. Bot. Gart. Berlin-Dahlem, 10: 346. 1928. TIPO: Bolivia. Santa Cruz, Cercado, Río Piraí, *J. Steinbach 7119* (holotipo, B, destruido; isotipos, F!, G!, K!).

Material representativo. BOLIVIA. **Dept. Santa Cruz:** Prov. Cordillera, over Río Seco on N side of settlement of Río Seco, along highway from Santa Cruz to Abapó, *M. Nee 49082* (MEXU, NY); Prov. Ñuflo de Chávez, E of San Javier on road to Concepción, *J. R. Abbott 16330* (MEXU); Prov. Guarayos, 5 km de las Juntas Ríos San Pablo y Negro de Caimanes, *I. G. Vargas et al. 2634* (UCZ). Prov. Ichilo, Choré, *R. Quevedo & J. Magne 254* (UCZ); Prov. Andrés Ibáñez, Santa Cruz de la Sierra, *A. Jiménez L. 71* (UCZ); Prov. Warnes, 9.5 km of Warnes, 2.5 km NW of Candelaria, *M. Nee 50532* (MEXU, NY). BRA-

SIL. **Mato Grosso do Sul:** Mun. Bonito, Campo Dos Indios, *G. Hatschbach et al. 73927* (MEXU). **Paraná:** Terra Rica, Várgea do Rio Paranapanema, proximo ao porto Euclides da Cunha, *L. A. Dambrós 267* (UEC). **Sâo Paulo:** Mun. Teodoro Sampaio, Reserva Florestal do Morro do Diabo, *H. F. Leitâo F. et al. 18486* (UEC). PARAGUAY. Río Apa. Aquidaban, *K. Fiebrig 4389* (G, GH).

Lonchocarpus riparius M. Sousa, sp. nov. TIPO: Bolivia. Depts. La Paz y Beni; basin of Río Beni, upstream from Rurrenabaque, Río Tuichi and Río Beni, on gentle slope near river, 14°35′S, 67°35′W, alt. 320 m, 13 May 1990, *D. C. Daly 6423* (holotipo, MEXU; isotipo, NY). Figuras 2, 4.

Arbor 12–15 m alta, ramis angulatis, solidis, velutinis; folia (5 ad)7-foliolata, rhachidi tereti, foliolis late ellipticis vel ellipticis, translucido-punctatis, infra velutinis. Inflorescentiae 8–14.5 cm longae, paniculatae. Flores 7.5–10 mm longi, petalis cremeis vel albis. Legumen (immaturum) glabrescens, sutura vexillari lata facta, duabus marginibus aliformibus limitata

Árboles 12–15 m alto; corteza interior con abundante fluido resinoso al corte; ramas anguladas, acostilladas, sólidas, de amarillento velutinas a glabrescentes, con lenticelas circulares a elípticas; estípulas caducas, ca. 3 mm largo, ca. 2 mm ancho, ligulares; pecíolo (1.4–)2–4 cm largo; raquis foliar (4.5–)7.5–9.5 cm largo, terete, acostillado, pardo-amarillento velutino; hojas (5 a)7-folioladas; folíolos (4.5–)7–11(–14) cm largo, (3–)3.5–5(–6) cm ancho, anchamente elípticos a elípticos, cartáceos a subcoriáceos, translúcido punteados y con las nervaduras de 3° y 4° orden translúcidas, la base generalmente redondeada, en ocasiones cuneada, el ápice obtuso a acuminado, el haz esparcido y el envés moderadamente pardo-amarillento velutino; nervación camptódroma, nervadura primaria y secundarias ligeramente realzadas en el envés, nervaduras laterales 7 a 11. Inflorescencias 8–14.5 cm largo, paniculadas, cortamente pedunculadas; floración coetánea; pedúnculos florales 1–2 mm largo, gruesos, moderadamente espaciados; pedicelos 1.7–2.7 mm largo; bractéolas opuestas, aplicadas al cáliz, ovadas a orbiculares, 0.9–1.2 mm largo, 0.9–1 mm ancho. Flores 7.5–10 mm largo; cáliz ciatiforme, casi trunco, 1.5–3 mm largo, 3–4 mm ancho, pardo-amarillento seríceo, translúcido punteado; corola blanca a color crema, translúcido punteada, los pétalos canescente seríceos; estandarte reflexo, su lámina casi orbicular, 6–7 mm ancho; ovario pardo-amarillento seríceo. Legumbre inmadura, recta a ligeramente curvada, aplanada, hasta 6.5 cm largo, hasta 1.3 cm ancho, elíptica a oblonga, con 1 a 4 semillas, esparcidamente serícea a glabrescente, la base cortamente atenuada, el ápice obtuso a apiculado, la sutura vexilar ensanchada, de hasta 4 mm de ancho, bordeada por 2 márgenes aliformes, la sutura carinal aquillada. Semillas inmaduras.

Distribución y hábitat. Se conoce en los límites de los departamentos de La Paz y Beni y en Santa Cruz. En hábitats riparios, a elevaciones 275–320 m.

Fenología. Con botones, flores de febrero a mayo y frutos inmaduros a mediados de mayo.

El epíteto hace referencia al hábitat ripario de esta especie.

Esta especie se caracteriza por las ramas anguladas que sólo se conocen dentro de la misma sección en *Lonchocarpus spiciflorus* Martius ex Bentham, pero esta última especie también cuenta con tallos fistulosos que albergan hormigas, mientras que *L. riparius* M. Sousa se diferencia por presentar tallos sólidos. Otro carácter a notar es su inflorescencia paniculada, porque las hojas no se desarrollan posteriormente, también presente en la misma sección en *L. sericophyllus* M. Sousa y en *L. atropurpureus* Bentham del grupo de *L. minimiflorus*.

Paratipos. BOLIVIA. Depts. La Paz y Beni, Río Beni, upstream from Rurrenabaque, above Arroyo Pacheco and Los Fósiles, growing by shore near Arroyo Los Fósiles, *D. C. Daly et al. 6510* (MEXU, NY); Dept. Santa Cruz, Prov. Ichilo, the turnoff 5.6 km E of Villa San Germán, 17°23′S, 64°03′W, *M. Nee 48416* (MEXU, NY).

Lonchocarpus sericophyllus M. Sousa, sp. nov. TIPO: Bolivia. Dept. Beni; Prov. Ballivián, carretera Carinavi–San Borja, cumbre de la Serranía del Pilón Lajas, bosque primario subandino, suelos areniscas, 15°17′S, 67°04′O, alt. 850–900 m, 1 Nov. 1989, *D. N. Smith & V. García 13828* (holotipo, MEXU; isotipos, MO, USZ). Figuras 2, 5.

Arbor ca. 35 m alta, ramis teretibus, dense brunneo-flavo-sericeis vel glabrescentibus; folia 5-foliolata, foliolis ellipticis vel lanceolatis, epunctatis, dense vel moderate brunneo-flavo-sericeis. Inflorescentiae (2.5–)4.5–7.5(–10) cm longae, axillares. Flores 8–9 mm longi, petalis cremeis. Legumen (immaturum) brunneo-flavo-sericeum, sutura vexillari lata facta, duobus marginibus aliformibus marginata.

Árboles ca. 35 m de alto; corteza exterior lisa, gris-marrón, la interior con algo de fluido resinoso al corte; ramas teretes, ligeramente acostilladas, sólidas, de densamente pardo-amarillento seríceas a glabrescentes, con lenticelas circulares a elípticas; estípulas caducas, 0.8–0.9 mm largo, 0.9–1 mm ancho, transversalmente triangulares; pecíolo 2.3–4 cm largo; raquis foliar 2.2–4 cm largo, terete, seríceo como las ramas, pronto glabro; hojas 5-folio-

Figura 4. *Lonchocarpus riparius* M. Sousa. —A. Rama con hoja, infrutescencias y legumbres. —B. Legumbres en diferentes posiciones, mostrando el margen vexilar ensanchado y aliforme. —C. Inflorescencia paniculada. —D. Unidad biflora, mostrando pedúnculo, pedicelos, bractéolas, cálices y flores. —E. Cáliz, mostrando bractéolas, pedicelo y cáliz ciatiforme. —F. Estandarte. —G. Ala. —H. Pétalos de la quilla, mostrando las puntuaciones translúcidas. —I. Gineceo sericeo. —J. Tubo estaminal. (A, B, *D. C. Daly et al. 6510* y C–J, *D. C. Daly 6423*.)

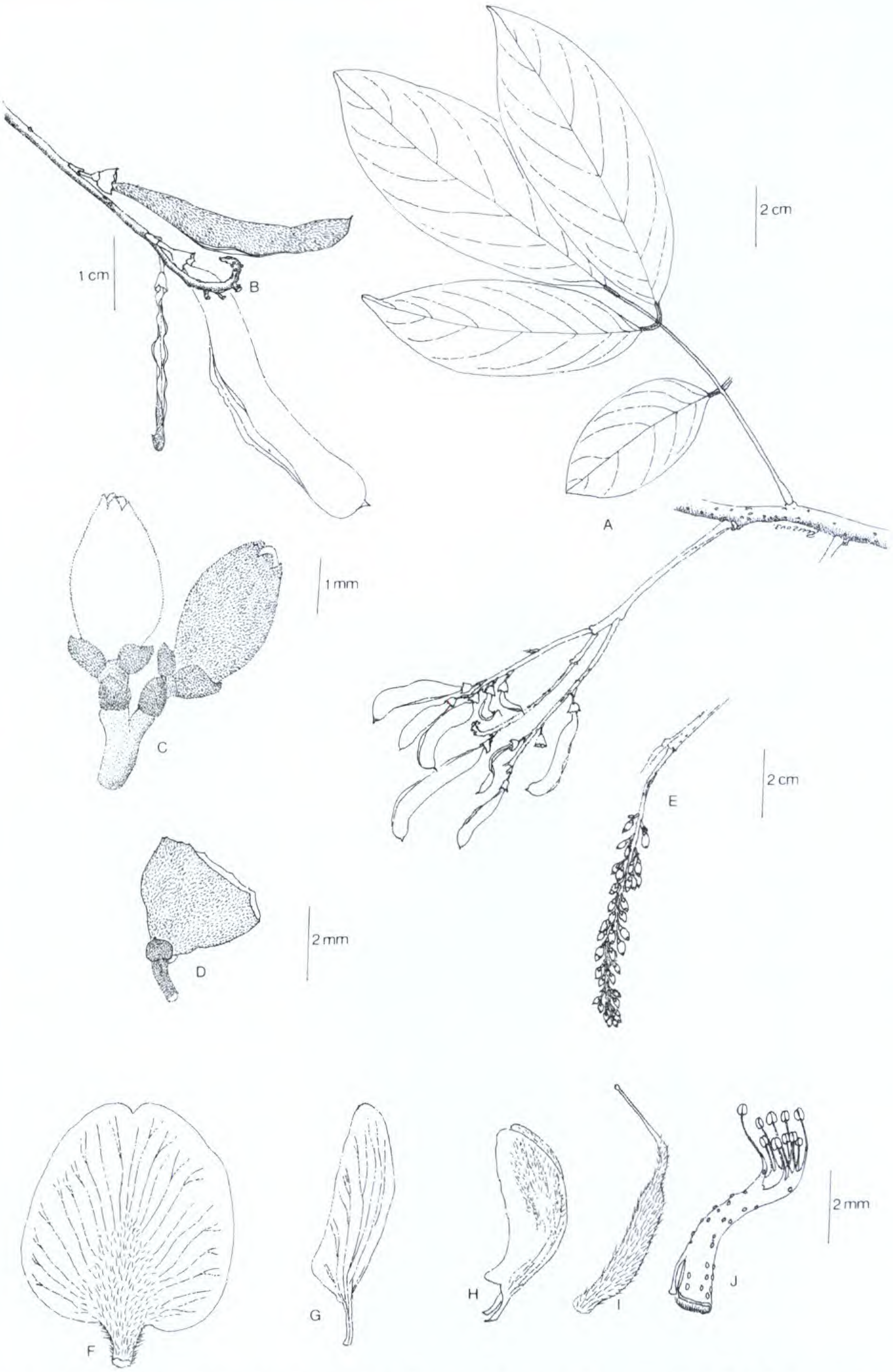

Figura 5. *Lonchocarpus sericophyllus* M. Sousa. —A. Rama con hoja e infrutescencia. —B. Infrutescencia, mostrando legumbres en diferentes caras con el margen vexilar ensanchado y aliforme. —C. Unidad biflora mostrando, pedúnculo, pedicelos, brácteas, bractéolas y botones florales. —D. Cáliz, pedicelo y bractéolas. —E. Inflorescencia. —F. Estandarte. —G. Ala. —H. Pétalos de la quilla. —I. Gineceo. —J. Columna de estambres. (A, B, D, F–J, *D. N. Smith & V. García 13828* y C, E, *G. Hartshorn & E. Meneces 2085*.)

ladas; foliolos (6–)7.5–10 cm largo, 3.2–4.2 cm ancho, elípticos a lanceolados, cartáceos a subcoriáceos, epunteados, pero las nervaduras de 3° y 4º orden translúcidas, la base cuneada, en ocasiones redondeada, el ápice acuminado, el haz de densamente pardo-amarillento seríceo a glabrescente, el envés de densa a moderadamente pardo-amarillento seríceo; nervación camptódroma, nervadura primaria y secundarias ligeramente realzadas en el envés, nervaduras laterales 7 a 9. Inflorescencias (2.5–)4.5–7.5(–10) cm largo, axilares o paniculadas, cortamente pedunculadas; floración coetánea; pedúnculos florales 1.5–2.5 mm largo, delgados, regularmente espaciados; pedicelos 2–3 mm largo; bractéolas opuestas, aplicadas al cáliz, ovadas, ca. 1.1 mm largo, ca. 0.9 mm ancho. Flores 8–9 mm largo; cáliz ciatiforme, casi trunco, 2.8–3 mm largo, 4–4.5 mm ancho, pardo-amarillento seríceo, epunteado; corola de color crema, epunteada, los pétalos canescente sericeos, estandarte reflexo, su lámina transversalmente elíptica, ca. 6 mm ancho; ovario pardo-amarillento seríceo. Legumbre inmadura, recta, aplanada, hasta 4.3 cm largo, hasta 0.9 cm ancho, oblonga, con 2 a 3 semillas, pardo-amarillento serícea, la base atenuada, el ápice rostrado, la sutura vexilar ensanchada, de hasta 3 mm ancho, bordeada por 2 márgenes aliformes, la sutura carinal aquillada. Semillas inmaduras.

Distribución y hábitat. Conocida de los departamentos de Beni y Pando, en selvas primarias subandinas, sobre suelos de areniscas a elevaciones de 850 a 900 m.

Fenología. Con botones florales a finales de octubre y el término de la floración e inicio de la fructificación a principios de noviembre.

Este epíteto se refiere a la pelosidad sedosa de sus hojas y en general de los renuevos.

Especie característica por su pelosidad densamente pardo-amarillento serícea, tanto en órganos vegetativos y florales, así como en las legumbres. También destaca entre las otras especies de Bolivia por sus folíolos y flores epunteados.

Paratipo. BOLIVIA. Dept. Pando, Cobija, camino a Puerto Heath, *G. Hartshorn & E. Meneces 2085* (USZ).

Las especies de la sect. *Lonchocarpus* presentes en Bolivia se destacan del resto de las de Sudamérica, por conglomerar a tres especies con flores blancas o cremas (*L. pluvialis* Rusby, *L. riparius* M. Sousa y *L. sericophyllus* M. Sousa), aclarando que se desconocen las flores de *L. lomentaceus* M. Sousa. También es notoria la presencia de tres especies con folíolos y pétalos translúcido punteados (*L. neei* M. Sousa, *L. pluvialis* Rusby y *L. riparius* M. Sousa).

Los endémicos nuevos para Bolivia, en gran medida pudieran tratarse de un endemismo real, pero probablemente sean resultado de la escasa recolecta en la región. Así, no se descarta en un futuro la presencia de algunas de estas especies en Brasil y Paraguay.

Clave para las Especies de la Sect. *Lonchocarpus* de Bolivia

1a. Raquis foliar marcadamente canaliculado.
  2a. Hojas y legumbres glabras, arbustos ca. 3 m alto, legumbre lomentácea se fragmenta en artículos monospermos . . . . . *L. lomentaceus* M. Sousa
  2b. Hojas y legumbres velutinas, árboles 7–20 m alto, legumbre sin fragmentarse en artículos monospermos . . . . . *L. neei* M. Sousa
1b. Raquis foliar terete.
  3a. Folíolos epunteados, densamente pardo-amarillento sericeos en el envés . . . . . *L. sericophyllus* M. Sousa
  3b. Folíolos translúcido punteados, velutinos en el envés.
    4a. Ramas teretes; inflorescencias axilares; frutos pardo-amarillento velutinos . . . . . *L. pluvialis* Rusby
    4b. Ramas anguladas; inflorescencias paniculadas; frutos casi glabros . . . . . *L. riparius* M. Sousa

Agradecimientos. A Fernando Chiang, por traducir al latín las diagnosis, a Gloria Andrade por su soporte a la elaboración del texto, a Ramiro Cruz y Elvia Esparza por sus magníficas ilustraciones botánicas y a Gabriela Sánchez por hacer el mapa de distribuciones. Finalmente a los curadores de los siguientes herbarios F, G, GH, K, MEXU, MO, NY, UEC, US, USZ que hicieron posible el estudio del material.

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Fortunato, R. H. y R. Palese. 1997. Una nueva combinación en el género *Lonchocarpus* Kunth (Leguminosae–Millettieae): *Lonchocarpus fluvialis* (Liendm.) Fortunato & Palese. *En* L. Ramella y P. Perret (editores), Notulae ad Floram paraguaiensem 62. Candollea 52: 509–511.

New Combinations for Chinese Bamboos (Poaceae, Bambuseae)

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ABSTRACT. On the basis of morphological characters inconsistent with their current taxonomic placements, new combinations are made for the following species of woody bamboos within the flora of China: *Ampelocalamus breviligulatus*, *Ampelocalamus hirsutissimus*, *Ampelocalamus melicoides*, *Drepanostachyum semiorbiculatum*, *Drepanostachyum ampullarium*, *Drepanostachyum membranaceum*, and *Bonia parvifloscula*. To accommodate broader generic concepts, new combinations are made for *Arundinaria qingchengshanensis* and *Arundinaria spanostachya*, and new status is given to *Bashania* as *Arundinaria* subgen. *Bashania*, and to *Sarocalamus* as *Arundinaria* subgen. *Sarocalamus*.

Key words: *Ampelocalamus*, *Arundinaria*, Bambuseae, *Bashania*, *Bonia*, China, *Drepanostachyum*, Poaceae, *Sarocalamus*.

During the preparation of a collaborative account of Chinese bamboos for the English-language *Flora of China*, it became apparent that there was a need for several new combinations for species names in *Ampelocalamus* S. L. Chen, T. H. Wen & G. Y. Sheng, *Drepanostachyum* Keng f., *Arundinaria* Michaux, and *Bonia* Balansa, and for the provision of names at subgeneric rank within *Arundinaria* s.l. for *Bashania* Keng f. & T. P. Yi and *Sarocalamus* Stapleton.

AMPELOCALAMUS

Ampelocalamus breviligulatus (T. P. Yi) Stapleton & D. Z. Li, comb. nov. Basionym: *Drepanostachyum breviligulatum* T. P. Yi, J. Bamboo Res. 12(4): 42. 1993. TYPE: China. Sichuan: Jiange Xian, 18 Dec. 1983, *Yi Tong-Pei 83208* (holotype, SIFS not seen).

Ampelocalamus hirsutissimus (W. D. Li & Y. C. Zhong) Stapleton & D. Z. Li, comb. nov. Basionym: *Drepanostachyum hirsutissimum* W. D. Li & Y. C. Zhong, in J. Bamboo Res. 16(1): 52. 1997. TYPE: China. Guizhou: Guiyang, Bamboo Garden of GF, 5 Mar. 1992, *Zhong Yuan-Chun et al. 9203* (holotype, GF not seen).

Ampelocalamus melicoides (Keng f.) D. Z. Li & Stapleton, comb. nov. Basionym: *Drepanostachyum melicoideum* Keng f., J. Bamboo Res. 5(2): 35. 1986. TYPE: China. Sichuan: Nanchuan Xian, 4 May 1957, *G. F. Li 60336* (holotype, NJNU; isotype, SZ).

Ampelocalamus and *Drepanostachyum* are subtropical clump-forming bamboo genera with type species from Hainan Island and the Himalayas of northwest India, respectively. They differ in several characters. The culm nodes and branching in *Ampelocalamus* are adapted for a semi-scandent growth habit, with expanded nodal sheath scars, geniculate lateral branches, a large central branch that often remains dormant, and a capacity for aerial root growth on the swollen bases of larger branches. Culms of *Drepanostachyum* are self-supporting and lack these adaptations. The inflorescence in *Ampelocalamus* also differs in having larger, broader spikelets (to 35 × 5 mm vs. 20 × 3 mm). *Ampelocalamus* is distributed from Taiwan and Hainan Island to the wettest parts of the Himalayas, especially on calcareous soils, while *Drepanostachyum* is found along the Himalayas in drier subtropical forest types associated with trees in *Quercus* L., *Schima* Reinwardt ex Blume, and *Castanopsis* (D. Don) Spach.

The two genera were confused by transferral of

most species of *Ampelocalamus* into *Drepanostachyum* (Keng, 1986; Yi, 1993) and eventually by the synonymizing of *Ampelocalamus* within *Drepanostachyum* (Li, 1997). However, recent molecular data (Ní Chonghaile, 2002) has suggested that they are not so closely related, with *Drepanostachyum* in a clade (Bootstrap Support 73%) that did not include *Ampelocalamus*.

The generic characteristics of *Ampelocalamus breviligulatus* have not been investigated in depth, but the large discrepancy in branch sizes with a dominant central branch and finer lateral branches, along with the deeply ridged culm internodes suggest that it is more likely to belong in *Ampelocalamus* than in *Drepanostachyum*. This is reinforced by its distribution in Sichuan and Gansu provinces of China, rather than the Himalayas.

Described as related to *Ampelocalamus scandens* Hsueh & W. D. Li, with apically arching culms and patelliform nodes, and illustrated as having a branch complement with strongly geniculate lateral branches, *Ampelocalamus hirsutissimus* would also appear more appropriately placed in *Ampelocalamus* rather than in *Drepanostachyum*. The ciliolate culm sheath margins and prominent leaf sheath oral setae are similar to those of *A. patellaris* and *A. scandens*, respectively.

The dominant central branch and geniculate lateral branches, along with broad spikelets suggest that *Ampelocalamus* is also more appropriate than *Drepanostachyum* for *A. melicoides*.

DREPANOSTACHYUM

Drepanostachyum semiorbiculatum (T. P. Yi) Stapleton, comb. nov. Basionym: *Fargesia semiorbiculata* T. P. Yi, J. Bamboo Res. 2(2): 40. 1983. TYPE: China. Tibet: Cona Xian, 7 Jan. 1978, *Jiang Changgui 1* (holotype, SIFS not seen).

Drepanostachyum ampullarium (T. P. Yi) Stapleton, comb. nov. Basionym: *Fargesia ampullaris* T. P. Yi, J. Bamboo Res. 2(2): 18. 1983. TYPE: China. Tibet: Zhangmu, 4 Nov. 1979, *M. L. Zhou 4* (holotype, SIFS not seen).

Drepanostachyum membranaceum (T. P. Yi) D. Z. Li, comb. nov. Basionym: *Fargesia membranacea* T. P. Yi, Acta Bot. Yunnan. 14(2): 135. 1992. TYPE: China. Sichuan: Mianning Xian, *Yi Tong Pei 90172* (holotype, SIFS not seen).

The type species of *Drepanostachyum*, *D. falcatum* (Nees) Keng f., was not known at all in China, while several well-known species of *Ampelocalamus* had been transferred into *Drepanostachyum*. Therefore *Drepanostachyum* was misunderstood in China, where it was considered very similar to *Ampelocalamus*, which was still recognized (Keng & Wang, 1996), albeit for only 2 less well-known species. Meanwhile, when species of *Drepanostachyum* were encountered in the Himalayas of southeast Tibet, they were placed in an altogether different genus, *Fargesia* Franchet. Section *Sphaerigemma* T. P. Yi and series *Ampullares* T. P. Yi were described largely to accommodate these mainly Himalayan species within *Fargesia*, because of their semi-orbicular culm buds and swollen culm nodes, not seen in other species of the genus.

Fargesia semiorbiculata and *F. ampullaris* also differed substantially from other species placed in *Fargesia* in their larger number of more subequal branches, leaf blades with indistinct transverse veins, the narrow apex and distally scabrous interior surface of their culm sheaths, and their subtropical rather than temperate habitats. These characteristics are shared with the type species of *Drepanostachyum*, *D. falcatum*, into which genus they are now transferred.

Fargesia membranacea differs from most other species in *Fargesia* in its semi-orbicular branch buds producing 13 to 33 subequal branches, its leaf blades with indistinct transverse veins, and the narrow apex to its culm sheaths, characteristics more suggestive of *Drepanostachyum* than *Fargesia*. Known only from southern Sichuan province, this species is well separated from all other species of *Drepanostachyum*.

ARUNDINARIA

Arundinaria subgen. **Sarocalamus** (Stapleton) D. Z. Li, stat. nov. Basionym: *Sarocalamus* Stapleton, Novon 14: 346. 2004. TYPE: *Sarocalamus racemosus* (Munro) Stapleton.

Arundinaria subgen. **Bashania** (Keng f. & T. P. Yi) D. Z. Li, stat. nov. Basionym: *Bashania* Keng f. & T. P. Yi, J. Nanjing Univ., Nat. Sci. Ed. 1982(3): 722. 1982. TYPE: *Bashania fargesii* (E. G. Camus) Keng f. & T. P. Yi.

Arundinaria qingchengshanensis (Keng f. & T. P. Yi) D. Z. Li, comb. nov. Basionym: *Bashania qingchengshanensis* Keng f. & T. P. Yi, J. Nanjing Univ., Nat. Sci. Ed. 1982(3): 725. 1982. TYPE: China. Sichuan: Guan Xian, 25 June 1981, *Yi Tong-Pei 80037* (holotype, SIFS).

Arundinaria spanostachya (T. P. Yi) D. Z. Li, comb. nov. Basionym: *Bashania spanostachya* T. P. Yi, Acta Bot. Yunnan. 11: 35. 1989. TYPE: China. Sichuan: Huili Xian, Beimu Shan, 18 May 1987, *Yi Tong-Pei 87249* (holotype, SIFS).

Although it is strongly suspected that *Bashania* Keng f. & T. P. Yi and *Sarocalamus* Stapleton are probably not closely related to the North American genus *Arundinaria* (Ní Chonghaile, 2002; Stapleton et al., 2004), the morphological distinctions are less pronounced than those between *Arundinaria* and all other Chinese genera. As the *Flora of China* follows a primarily morphological classification system, these three genera will be merged into a rather broadly interpreted *Arundinaria*. Hopefully further molecular data will provide clarification of the true relationships between these groups. New combinations in *Arundinaria* are required for two species of *Bashania*, while *B. fargesii* and the remaining two species of *Sarocalamus* already have combinations in that genus, and the affinities of three further, more recently described species of *Bashania* remain unclear.

Bonia

Bonia parvifloscula (W. T. Lin) N. H. Xia, comb. nov. Basionym: *Monocladus parvifloscula* W. T. Lin, J. Bamboo Res. 12(3): 3. 1993. TYPE: China. Guangdong: Zhaoqing, Qixingyan, *Z. K. Li 84126* (holotype, CANT).

The genus *Monocladus* Chia, H. L. Fung & Y. L. Yang et al. was established for tropical bamboos from south China with solitary branches and spikelets with a well-separated basal floret. It was not realized that species of the earlier genus *Bonia* Balansa also had these characteristics (Xia, 1996). The characteristics of *Monocladus parvifloscula* are not well known as the only collections made so far are poor, but it would appear that it also represents a species of *Bonia* rather than any other genus.

Acknowledgments. The corresponding author thanks Missouri Botanical Garden for funding this research and the Keeper of the Herbarium of the Royal Botanical Gardens, Kew, for providing working facilities.

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New and Interesting Milkweeds (Apocynaceae, Asclepiadoideae)

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ABSTRACT. *Matelea corrugata*, from Costa Rica, *M. costaricensis*, from Costa Rica, *M. emmartinezii*, from Mexico, *M. ferruginea*, from Guatemala, *M. filipes*, from El Salvador, *M. haberi*, from Costa Rica, *M. insolita*, from Nicaragua, and *M. velutinoides*, from Mexico and Guatemala, are described as new. The new combinations *Ditassa nigrescens* (= *Ditassa tatei*), *Gonolobus glaberrimus* (= *Matelea tikalana*), *Marsdenia fruticosa*, and *Polystemma guatemalense* (= *Matelea quirosii*), are proposed, and the latter two are lectotypified. *Asclepias angustifolia*, *A. auriculata*, *A. similis*, *Gonolobus barbatus*, *G. erianthus* (= *G. macranthus*), *G. guatemalensis*, *Marsdenia gymnemoides*, *Matelea gentlei*, and *Pherotrichis schaffneri* are lectotypified or neotypified. The typification, synonymy, and application of *Pherotrichis villosa* are discussed.

Key words: Apocynaceae, Asclepiadoideae, Mesoamerica, Guianas, *Asclepias*, *Ditassa*, *Gonolobus*, *Marsdenia*, *Matelea*, *Pherotrichis*, *Polystemma*.

In the course of ongoing studies of milkweeds, several new species, new combinations, and nomenclatural trivia have come to light and are presented here.

Asclepias angustifolia Schweigger, Enum. Pl. Hort. Regiom. 13. 1812. TYPE: Hort. Saltzwedel, Frankfurt, Oct. 1825, *G. Engelmann s.n.* (neotype, here designated, MO-2761538).

Woodson (1954) discussed the application of this name, which he was substituting for the then better known *Asclepias rubricaulis* HBK. *Asclepias angustifolia* Schweigger was based on a plant cultivated at the Königsberg botanical garden, acquired from the Berlin botanical garden. If a type specimen existed, it probably would have been at KBG and is no longer extant. Woodson (1954) suggested that herbarium specimens at MO, prepared from plants cultivated in other German botanical gardens during that era, and bearing Schweigger's name, probably represented the original introduction and serve to fix the usage of the name. Woodson was clearly neotypifying *Asclepias angustifolia*, but since there are four specimens at MO fitting his general description it seems prudent to select one specimen to formalize this decision.

Woodson (1954: 151) cites "*Gomphocarpus angustifolius* Link" as a synonym of *Asclepias fruticosa* L. However, "*Gomphocarpus angustifolius* Link" is actually a combination based on *Asclepias angustifolia* Schweigger, *Gomphocarpus angustifolius* (Schweigger) Link and surely was included in the synonymy of *A. fruticosa* in error. Goyder and Nicholas (2001) list *Gomphocarpus angustifolius* and its basionym as possible synonyms of *G. fruticosus* (L.) W. T. Aiton, based on Woodson's synonymy, but note that the type is no longer extant and the identity uncertain. Therefore, this neotypification clarifies the synonymy of *Gomphocarpus fruticosus* by removing *Asclepias angustifolia* Schweigger and *Gomphocarpus angustifolius* (Schweigger) Link as candidates.

Asclepias auriculata HBK, Nov. Gen. Sp. (quarto ed.) 3: 191, t. 228. 1819. TYPE: Nov. Gen. Sp. (quarto ed.) 3: t. 228. 1819 (lectotype, designated here).

The original description cites "Crescit locis alsis prope Ario Mexicanorum, alt. 1000 hex. . . .Floret Septembri." Woodson (1954) gives the type as *Bonpland s.n.*, but did not see a specimen. Original material still has not been located, and in its absence I propose the original plate as the lectotype.

Asclepias similis Hemsley, Biol. Cent.-Amer., Bot. 2(10): 326. 1881. TYPE: "South Mexico, Chiapas etc.," *A. Ghiesbreght 666* (lectotype, designated here, K; duplicates of lectotype, G, MO).

Hemsley cited two collections in his description of the species, *Ghiesbreght 665* and *666*, both at K. Woodson (1954) gives *Ghiesbreght 665* at MO as a type. While this could be considered a lectotypification, Woodson's "Index to Exsiccatae" in the same publication lists *Ghiesbreght 665* as *Asclepias pellucida* E. Fournier and *Ghiesbreght 666* as *A. similis*. The actual specimens of both collections at MO were annotated by Woodson as *Asclepias similis*. *Asclepias similis* and *A. pellucida* are sympatric

in southern Mexico and, as noted by Standley and Williams (1969), are difficult to distinguish without follicles. Although I agree with Woodson's determinations of both collections as *Asclepias similis*, and neither collection has follicles, it still seems important that *Asclepias similis* be lectotypified, and *Ghiesbreght 666* is the less ambiguous choice.

Ditassa nigrescens (E. Fournier) W. D. Stevens, comb. nov. Basionym: *Astephanus nigrescens* E. Fournier, Ann. Sci. Nat., Bot., sér. 6, 14: 367. 1882. TYPE: Venezuela. "Guyana Anglica, pr. Boraima," *M. Schomburgk 915* (holotype, B not seen).

Ditassa nigrescens is a rather common species in the adjacent areas of Venezuela, Guyana, and Brazil. The species was treated as *Ditassa tatei* Gleason & Moldenke (in Gleason, Bull. Torrey Bot. Club 58: 456. 1931. Holotype: Venezuela. Esmeralda, *R. Tate 199*, NY, = *Cynanchum tatei* R. W. Holm) in the *Flora of the Venezuelan Guayana* (Morillo, 1997). However, the original diagnosis of *Ditassa tatei* cited two collections in addition to the type: *R. Spruce 3226* (K) and *Schomburgk 915* (B). Since *Schomburgk 915* at B was already the holotype of *Astephanus nigrescens*, *Ditassa tatei* is a superfluous name under Article 52 of the *Saint Louis Code* (Greuter et al., 2000), and clearly the two concepts are synonymous.

Gonolobus barbatus HBK, Nov. Gen. Sp. (quarto ed.) 3: 209, t. 239. 1819. TYPE: Nov. Gen. Sp. (quarto ed.) 3: t. 239. 1819 (lectotype, designated here).

The original description cites "Crescit in litore Mexicano, prope Campeche." Original material has not been located and in its absence I propose the original plate as the lectotype.

Gonolobus erianthus Decaisne, in A. de Candolle, Prodr. 8: 592. 1844. *Vincetoxicum erianthum* (Decaisne) Arthur, Torreya 21: 11. 1921. TYPE: Mexico. Veracruz: Bois près Jalapa, 4000 ped., *H. Galeotti 1519* (lectotype, designated here, P; duplicates of lectotype, BR, G, K, P).

Decaisne published *Gonolobus erianthus* either as a replacement for a putative later homonym ("*G. grandiflorus* Benth.," not *G. grandiflorus* (Cavanilles) R. Brown ex Schultes) that was never published or perhaps in recognition that Bentham's application of the name was in error, but in either case must be considered to be newly described by Decaisne. The selected lectotype is the best of the four specimens at P cited by Decaisne; the unselected syntypes are: *H. Galeotti 1532* (BR, P), *1539* (BR, P), and *K. Hartweg 211* (GH, K, NY, P). The name *Gonolobus macranthus* Kunze (Linnaea 20: 27. 1847) is, from the diagnosis, clearly synonymous with *G. erianthus*, and was used for the species in *Flora de Nicaragua* (Stevens et al., 2001); it was based on cultivated material from Mexico and any original specimens or illustrations, if such existed, were at LZ and are no longer extant (Peter Otto, pers. comm.).

Gonolobus glaberrimus (Woodson) W. D. Stevens, comb. nov. Basionym: *Matelea glaberrima* Woodson, Ann. Missouri Bot. Gard. 28: 281. 1941. TYPE: Guatemala. Petén: Uaxactun, 24 Mar. 1931, *H. Bartlett 12300* (holotype, MO; isotypes, MICH, MO, US).

Matelea tikalana Lundell, Phytologia 16: 446. 1968. Syn. nov. *Marsdenia tikalana* (Lundell) Lundell, Wrightia 4: 49. 1968. TYPE: Guatemala. Petén: Tikal Nat. Park, 20 Mar. 1959, *C. Lundell 15763* (holotype, LL).

Gonolobus glaberrimus is most closely related to *G. hammelii* W. D. Stevens and *G. hadrostemma* W. D. Stevens, from which it differs by having glabrous leaves among many other obvious characters; the three species are anomalous in *Gonolobus* in having a massive corona adnate to the faucal annulus and in lacking free appendages on the anther backs, but seem better placed in *Gonolobus* than in *Matelea*. *Matelea tikalana* is placed into the synonymy of *Gonolobus glaberrimus* because the two type collections are virtually identical.

Gonolobus guatemalensis K. Schumann, in Engler & Prantl, Nat. Pflanzenfam. 4(2): 302. 1895. TYPE: Guatemala. Alta Verapaz: Pansamalá, 4000 ft., Apr. 1887, *H. von Tuerckheim 1124* (lectotype, designated here, US).

Gonolobus velutinus Schlechtendal var. *calycinus* J. D. Smith, Bot. Gaz. 13: 189. 1888. TYPE: Guatemala. Alta Verapaz: Pansamalá, 4000 ft., Apr. 1887, *H. von Tuerckheim 1124* (holotype, US).

Schumann intended *Gonolobus guatemalensis* to be a new name for "*G. velutinus* Donn.-Smith, nicht Schlecht.," but technically the name must be considered newly published by Schumann. Schumann's key adequately diagnoses the species and this lectotypification simply formalizes his obvious intention of renaming Smith's taxon by selecting the same type.

Marsdenia fruticosa (J. D. Smith) W. D. Stevens, comb. nov. Basionym: *Nephradenia fruticosa* J. D. Smith, Bot. Gaz. 16: 196. 1891. TYPE: Guatemala. Alta Verapaz: rocky islands in Río Rubelcruz, Apr. 1889, *J. Smith 1742* (lectotype, designated here, US).

While Smith's diagnosis intentionally distinguished *Nephradenia fruticosa* from *N. neriifolia* (Decaisne) Bentham & J. D. Hooker (= *Marsdenia neriifolia* (Decaisne) Woodson), it has always been considered a synonym of the same, e.g., by Woodson (1941), Standley and Williams (1969), and Omlor (1998), probably because the two species have an erect, *Asclepias*-like habit, unique among North American *Marsdenia*, and are practically indistinguishable from each other vegetatively. However, the flowers and fruits of the two species are quite different. *Marsdenia fruticosa* has cream-colored flowers versus purple in *M. neriifolia*; a campanulate corolla with the tube longer than the lobes versus rotate with the lobes longer than the tube; corona lobes that are widest at the base and connected to the anther back by a thin wing versus widest in the middle and directly adnate to the anther back; follicles that are short and broad versus long and thin; and seeds that are without a coma and have a thick, spongy wing versus normal comose seeds without corky wings. Several genera of milkweeds have a species or two that have lost the seed coma and develop spongy wings associated with becoming rhyophytes, and this species is apparently a rhyophyte. *Marsdenia fruticosa*, *M. neriifolia*, and *M. laxiflora* J. D. Smith (a twining or trailing species) are clearly closely related, and seem to be relatively isolated among North American *Marsdenia*. The unselected syntype of *Nephradenia fruticosa* is *H. von Tuerckheim 1251*, US.

Marsdenia gymnemoides W. Rothe, Bot. Jahrb. Syst. 52: 409, t. 3. 1915. TYPE: Guatemala. Huehuetenango: Nentón, Uaxac kanal, July 1887, *C. Seler & E. Seler 2804* (lectotype, designated here, F).

The two syntype collections (*C. Seler & E. Seler 2804, 3093*) were both at B and are no longer extant. A fragment of one of the syntypes is at F and is chosen as the lectotype. Lectotypification seems especially important in this case because Rothe's (1915) drawing of *Marsdenia gymnemoides* is ambiguous, combining some characters of *M. gymnemoides*, as represented by the lectotype, and *M. tubularis* L. O. Williams, a similar and nearly sympatric species.

Matelea corrugata W. D. Stevens, sp. nov. TYPE: Costa Rica. Puntarenas: Reserva Forestal Golfo Dulce, Aguabuena, sector oeste, 50–150 m, 8°42′20″N, 83°31′30″W, 17 Dec. 1991, *R. Aguilar 764* (holotype, MO). Figure 1.

A speciebus *Matelearum* indumento simplici foliis coriaceis crassinervibus corona simplici polliniis triqueteris profunde excavatis indumento corollae singulari distinguenda.

Coarse woody vine, older stems and base unknown, latex white, young stems densely pilose, obscuring surface, trichomes 0.5–1 mm long, straight or twisted, yellow fading to dull white, erect to deflexed, internodes 3–11 cm. Leaves opposite, blades elliptic or slightly ovate or obovate, coriaceous, 6–13.2 × 2.2–6.3 cm, apex abruptly acuminate, base obtuse, rounded, truncate or shallowly cordate, sinus to 2 mm deep, adaxially glossy, sparsely appressed-scabrous, trichomes 0.2–0.7 mm long, abaxially densely appressed-pilose, obscuring surface, trichomes 0.7–1 mm long, lateral veins 6 to 8 pairs, prominent above and below, middle veins 45°–55° to midrib, colleters 4 to 10, long and curved, irregularly scattered along the basal 5–15 mm of midrib; petiole 1.2–3.7 cm, densely pilose. Inflorescence congested-racemiform, densely pilose, peduncle 0–2 mm, pedicel 3–8 mm, bracts 0.7–1.5 × 0.3–0.5 mm, deltate, pubescent; calyx tube 1–1.2 mm long, with 1 colleter per sinus within, lobes elliptic, obovate or spathulate, cucullate, 4–6.5 × 3.5–3.6 mm, apex rounded, green, densely appressed-pilose outside, trichomes 0.2–0.5 mm long, glabrous inside; corolla briefly campanulate and then rotate, brown, sometimes with pale purple in center, abaxially glabrous except sparsely appressed-pilose in the center of the lobes, trichomes 0.2–0.3 mm long, adaxially hispidulous in a ring in the tube and in 5 radial lines opposite the anthers connecting the ring with the corona, thus leaving 5 trapezoidal glabrous patches in the base of the tube alternate with the anthers, trichomes ferrugineous, ca. 0.05 mm long, corolla tube 2.5–4 mm long, lobes broadly elliptic, asymmetrical at the base, 3.8–5.5 × 6–7 mm, apices rounded and emarginate, patent, one side of each lobe verrucose within; gynostegium sessile, corona a fleshy disk more or less hidden below gynostegium, apparently purple or reddish purple, outer margin shallowly 5-lobed and finely and inconspicuously dentate, ca. 0.7 mm wide at the lobes and 0.5 mm wide between the lobes, with 5 raised cushions alternate with the anthers; anthers trapezoidal in outline, dorsally with a pair of horny ridges, 0.7–0.9 × 1.3–1.8 mm, guide rails straight, flaring apart ca. 45° and tilted

Figure 1. *Matelea corrugata* W. D. Stevens. Scan of holotype specimen (*Aguilar 764*, MO).

ca. 45° under style apex, 0.2–0.3 mm long, terminal appendages narrow strips appressed to margin of style apex, 0.2–0.4 × 0.9–1.3 mm, white; corpusculum 0.24–0.31 × 0.10–0.13 mm, ellipsoid to subsagittate, brown, translators 0.31–0.38 × 0.14–0.19 mm, slightly curved, flat, pollinia 0.69–0.76 × 0.46–0.51 mm, asymmetrically ovoid, strongly 3-dimensional (triquetrous), sterile and deeply excavated in proximal half, forming a tube into center of the pollinium; style apex 2.3–2.7 mm wide, pen-

tagonal, slightly concave, apparently brown. Follicles fusiform, 12–15 × 3–3.5 cm, apex acute to attenuate, base acute, green or green-black, densely ferrugineous-pilosulose, with scattered broad-based, conical prickles (ca. 3 per cm²), prickles 2–4 mm long, 1–3 mm wide at middle; seeds obovate, 10–11 × 5.5–6.5 mm, brown, margin 0.6–1.2 mm wide, entire or inconspicuously undulate, surface smooth, coma ca. 2.5 cm long, tawny.

Matelea corrugata is distinctive in appearance and not clearly related to any other Mesoamerican species, although clearly falling within the current circumscription of *Matelea*. The pattern of corolla indumentum and the pollinium shape, as described above, are unique. Two of the collections, including the type, are from lower elevation (50–600 m) wet forest in southeastern Costa Rica and two are from higher elevation (900–1200 m) cloud forests in northern Costa Rica, but the four collections are practically identical. *Matelea corrugata* has been collected in flower in September, November, and December.

Paratypes. COSTA RICA. **Alajuela:** San Ramón, Zapotal, Río Barranquilla, *E. Bello C. & E. Cruz L. 5313* (MO); Monteverde Cloud Forest Reserve, Río Peñas Blancas, *W. Haber & E. Bello C. 6399* (MO). **Puntarenas:** Osa Sierpe, entre Cerro Chocuaco y Cerro El Faro, *G. Herrera C., R. Soto & P. García M. 4610* (MO).

Matelea costaricensis W. D. Stevens, sp. nov. TYPE: Costa Rica. San José: Cantón de Acosta, Hda. Tiquires, camino a Aguas Buenas, 1600–1800 m, 9°43′10″N, 84°10′50″W, 3 June 1995, *J. Morales 4283* (holotype, MO). Figure 2.

Mateleae pinguifoliae et *M. pseudobarbatae* affinis, sed differt corolla intra hispidulosa corona fere integra.

Vine, herbaceous or somewhat woody, base unknown, latex white, young stems with mixed indumentum, long trichomes moderately dense, 1–3 mm, straight, pale yellow, spreading, short trichomes dense, 0.1–0.2 mm, straight, white, glandular trichomes dense, ca. 0.1 mm, brown, internodes 7–17 cm. Leaves opposite, blades ovate, 6–12.2 × 3.4–7.2 cm, apex acuminate, base lobate, lobes convergent to overlapping, sinus 0.8–2.5 cm deep, adaxially with moderately dense long and short trichomes, long trichomes 0.5–1.5 mm, sometimes with sparse glandular trichomes on veins and at base, abaxially with dense short and glandular trichomes, sometimes with a few long trichomes on veins, lateral veins 5 to 7 pairs, middle veins 40°–45° to midrib, colleters 7 to 12; petiole 2–7.5 cm, with mixed indumentum, long trichomes sometimes sparse. Inflorescence racemiform or congested-racemiform, with mixed indumentum, peduncle 9–34 mm, axis to 7 mm, pedicel 11–26 mm, bracts 2.8–6 × 0.3–0.8 mm, linear or narrowly lanceolate; calyx tube 0.5–0.8 mm long, with 1 to 3 colleters per sinus, lobes lanceolate, 3.3–5.6 × 1.2–1.8 mm, apex acute, green, with dense mixed indumentum outside, long trichomes 0.4–1.5 mm, glabrous inside; corolla briefly campanulate then rotate, olive green, yellow-green, green-brown, or orange-brown, abaxially with mixed indumentum or sometimes lacking glandular trichomes, adaxially hispidulose, trichomes translucent white, 0.1–0.2 mm, tube 1.7–2.3 mm long, lobes ovate, 5.9–8.4 × 3.4–4.2 mm, apex rounded and shallowly notched; gynostegium sessile, outer corona stipitate below, cupuliform above, stipe 0.6–0.8 mm long, obconic, with color and texture of corolla, upper part fleshy, glabrous, pentagonal in outline, 0.8–1 mm long, 0.3–0.6 mm thick, distal margin entire or weakly 2-tiered opposite anthers, deep purple-black, somewhat exceeding base of gynostegium, inner corona of 5 adnate ligules opposite outer corona lobes and anthers, linear with free truncate tips incumbent on backs of anthers, free tips 0.2–0.3 × 0.2 mm; anthers trapezoidal in outline, 0.5–0.6 × 0.8–0.9 mm, tilted under style apex, guide rails straight, parallel, tilted under style apex, ca. 0.1 mm long, terminal appendages appressed to style apex, 0.4 × 0.8–0.9 mm, white, corpusculum 0.21–0.26 × 0.09–0.13 mm, sagittate, red-brown, translators 0.15–0.19 × 0.1–0.14 mm, pollinia 0.39–0.44 × 0.24–0.28 mm, angularly and asymmetrically obovate, sterile at attachment; style apex 1.5–1.9 mm wide, slightly pentagonal, nearly round, flat or slightly concave, pink. Immature follicles divergent when double, fusiform, to 7 × 1.5 cm, green, with dense mixed indumentum, long trichomes 1–1.5 mm, apex long-attenuate, base stipitate with a flange at pedicel attachment, with scattered prickles (ca. 70 total), prickles ca. 12 mm long, 1 mm wide at middle; seeds unknown.

Matelea costaricensis is most closely related to *M. pinguifolia* (Standley) Woodson and *M. pseudobarbata* (Pittier) Woodson, but differs from those in lacking glandular trichomes on the upper leaf surface, in having larger flowers, the inside of the corolla hispidulous, and the outer corona more strongly pentagonal and nearly entire, lacking the distinct coronal layers of the related species.

Matelea costaricensis is known only from cloud forests in the mountains of central Costa Rica at 1500 to 2000 m elevation; flowers have been col-

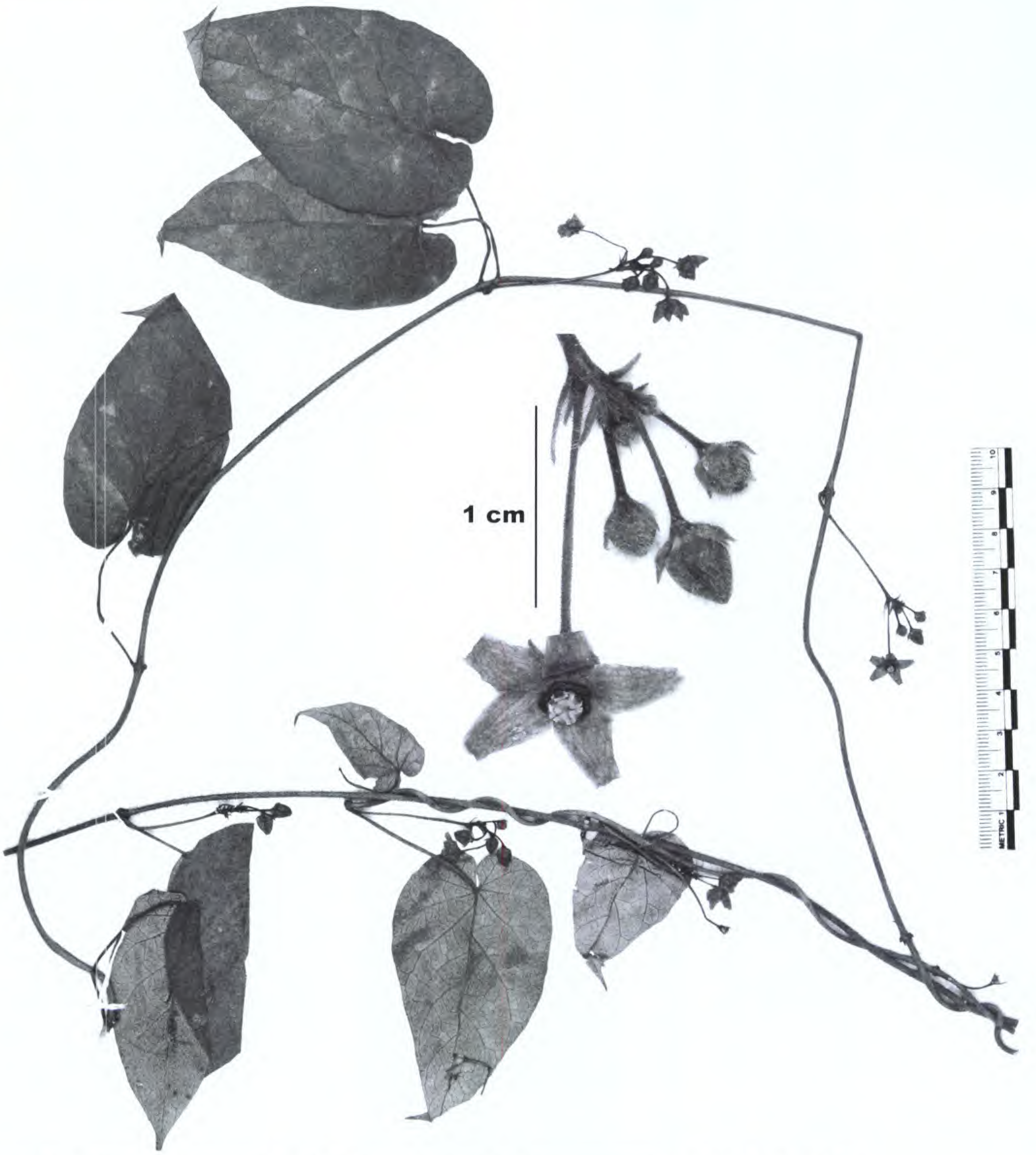

Figure 2. *Matelea costaricensis* W. D. Stevens. Scan of holotype specimen (*Morales 4283*, MO).

lected from April to November and immature fruits in November and December.

Paratypes. COSTA RICA. **Alajuela:** Zarcero, *A. Smith 1352* (F), *P1970* (MO), *2786* (F), *A. Weston 3078* (MO). **San José:** Z.P. Cerros de Escazú, SE del Alto de Hierbabuena, *J. Morales 1323* (MO).

Matelea emmartinezii W. D. Stevens, sp. nov. TYPE: [cultivated at Missouri Botanical Garden from *W. Stevens & E. Martínez S. 25819*, Mexico, Chiapas: 2 km N of Naja, 860 m, 16°59′N, 91°36′W, 4 Sep. 1988], *W. Stevens 25956* (holotype, MO). Figure 3.

Differt a *Matelea pusilliflora* et *M. ocellata* lobis corollarum cucullatis.

Vine, older stems woody and covered with thick, ridged, spongy, tan-colored cork, roots fibrous, latex white, young stems with a mixed indumentum, long trichomes in 2 lines, appressed, 0.3–0.7 mm, white with red septa, glandular trichomes 0.03–0.05 mm, pale red-brown, internodes 2–12 cm. Leaves opposite, blades ovate, 4–5.5 × 1.5–2 cm, apex attenuate, apiculate or not, base truncate or very shallowly cordate, pusticulate, adaxially glabrous except with sparse glandular trichomes on base of midrib, abaxially glabrous except with mixed in-

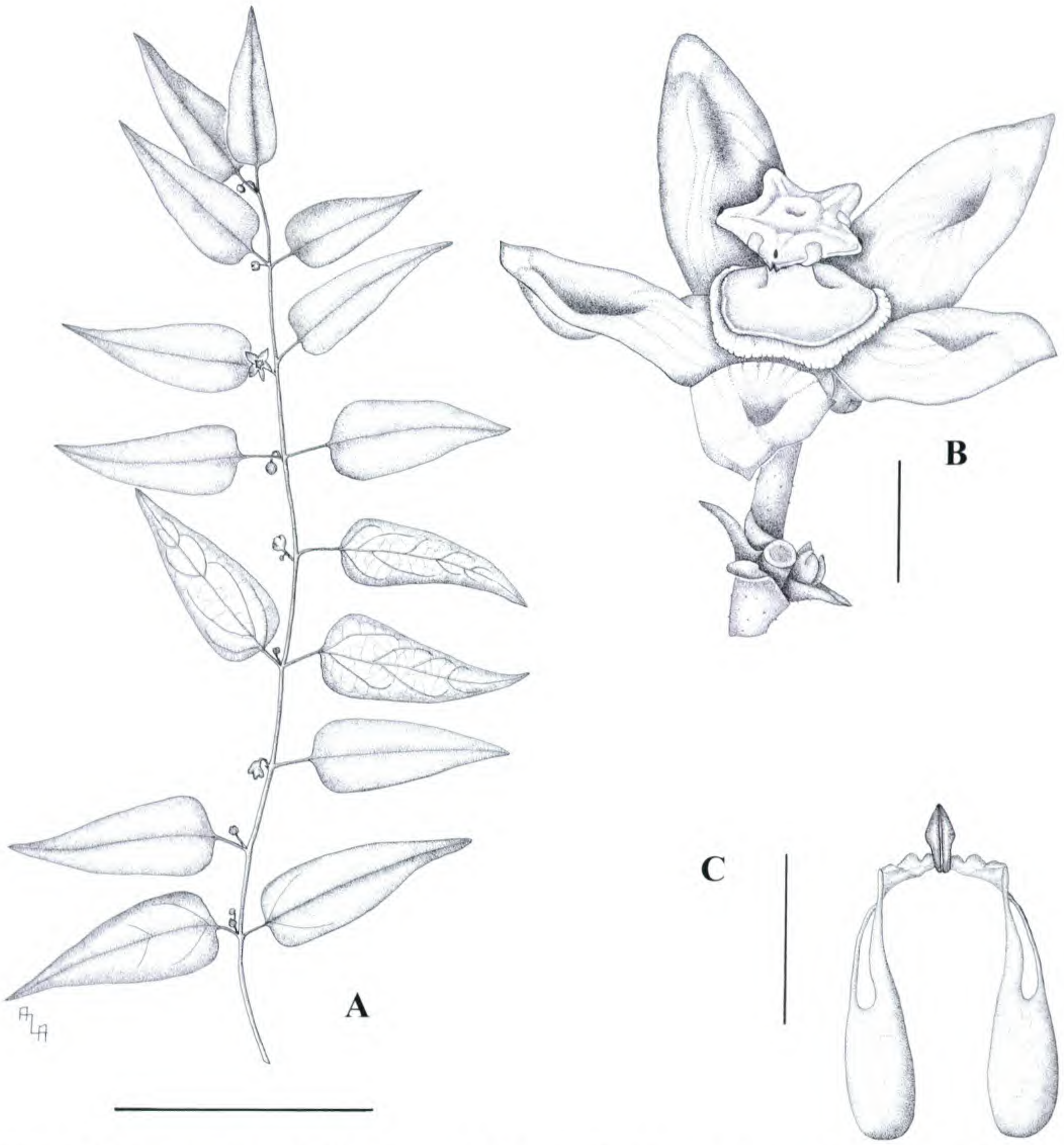

Figure 3. *Matelea emmartinezii* W. D. Stevens. —A. Flowering branch. —B. Flower. —C. Pollinarium. Drawn from the holotype, *Stevens 25956* (MO).

dumentum on midrib and glandular trichomes on secondary veins, lateral veins 4 to 5 pairs, strongly curved, middle veins 40°–45° to midrib, colleters 2 to 4; petiole 0.5–1 cm, with mixed indumentum or only glandular trichomes. Inflorescence congested-racemiform, peduncle 0.5–1 mm, glabrous, pedicel 2–2.5 mm, with sparse glandular trichomes, bracts 1–2.5 × 0.2–0.4 mm, deltate to ligulate, glabrous, purple; calyx tube ca. 0.5 mm long, with 1 colleter per sinus, lobes elliptic, ca. 2.2 × 0.9 mm, apex acute, purple, glabrous or with a few glandular trichomes on base outside; corolla rotate, green with dense brownish purple reticulations, with a bright white spot at tip of each corolla lobe within, adaxially glabrous, abaxially with short trichomes and glandular trichomes on the distal half of each lobe, tube 1–1.3 mm long, lobes elliptic, the center of each lobe cucullate, ca. 4 × 2.7 mm, apex rounded and notched when flattened, patent; gynostegium with a cylindrical stipe ca. 0.7 mm long, outer corona a fleshy disk, ca. 1 mm wide, green and glistening above, base pentagonal in outline and overlapping corolla tube, margin dull, radially striate, purple, inner corona of 5 small lobes at apex of stipe, ca. 0.2 × 0.3 mm, tips bilobulate and appressed to the bases of the anthers; anthers dorsoventrally flattened, ca. 0.4 × 1.5 mm, guide rails straight, parallel, vertical, ca. 0.1 mm long, termi-

nal appendages appressed to margin of style apex, ca. 0.2 mm wide, white, corpusculum ca. 0.21 × 0.8 mm, sagittate, brown, translators ca. 0.19 mm long, pollinia ca. 0.81 × 0.24 mm, obovoid, sterile and excavated on proximal third near center; style apex ca. 2.3 mm wide, star-shaped, shallowly convex with a central depression. Follicles and seeds unknown.

This new species is most closely related to *Matelea pusilliflora* L. O. Williams and *M. ocellata* W. D. Stevens, which until now were the only mainland representatives of a small group of Caribbean species characterized by asymmetrical, narrowly 5-winged follicles, a corona in the form of a fleshy disk at the base of the gynostegium stipe, and a white, reflective eye at the tip of each corolla lobe. *Matelea emmartinezii* differs from both by having cucullate corolla lobes, by having an outer corona smooth and unadorned except striate on the outer margin, and by having a small but obvious inner corona. Additionally, *Matelea ocellata* has no pusticulations on the leaves and longer inflorescences (peduncles 1–9 mm and pedicels 4–14 mm) and *M. pusilliflora* has smaller flowers (corolla lobes 2.3–2.7 mm long).

Matelea emmartinezii was collected in sterile condition in an opening in dry forest in Chiapas and later flowered in cultivation; it is known from no other collections.

Matelea ferruginea W. D. Stevens, sp. nov. TYPE: Guatemala. Chimaltenango: region of Los Positos, above Las Calderas, 2250–2400 m, 16 Dec. 1940, *P. Standley 80219* (holotype, F; isotype, MO). Figure 4.

Mateleae magnifoliae affinis, sed differt gynostegio stipitato corona praelonga.

Large vine, older stems and base unknown, latex unknown, young stems with mixed indumentum, long trichomes moderately dense, 2–3 mm, straight, pale yellow-brown, spreading, short trichomes dense, 0.2–0.4 mm, straight, pale yellow-brown, glandular trichomes sparse to moderately dense, 0.2–0.4 mm, stalk pale yellow-brown, tips brown, hardly or not at all inflated, internodes 17–22 cm long. Leaves opposite, blades ovate to elliptic, 12–19 × 8.7–14 cm, apex acuminate, base lobate, lobes descending to converging, sinus 1.7–2.5 cm deep, pilose, trichomes 0.5–1 mm, pale yellow-brown, lateral veins 6 to 8 pairs, middle veins 45°–50° to midrib, colleters 18 to 20; petiole 6.5–12.5 cm, with mixed indumentum. Inflorescence congested-racemiform, with mixed indumentum, peduncle 55–135 mm, pedicel 18–20 mm, bracts to 11.5 × 2.7 mm, elliptic, acuminate; calyx tube ca. 1 mm long, with 1 colleter per sinus, lobes elliptic to spathulate, unequal, flat or somewhat cucullate, 7.3–8.6 × 5.4–6 mm, apex rounded, green, with dense, appressed, yellow-brown long trichomes outside, trichomes 0.5–1.5 mm, glabrous inside; corolla very briefly campanulate then rotate, yellowish green, reticulate when dried, with dense, appressed, yellow-brown long trichomes outside, trichomes 0.5–1 mm, glabrous inside, tube ca. 4.8 mm long, lobes broadly elliptic, somewhat asymmetric, 10.5–11.5 × 8.6–9.5 mm, apex rounded and shallowly notched; gynostegium with stipe ca. 1.3 mm long, corona adnate to stipe, 5-lobed, fleshy, ca. 1.1 mm tall, 0.9 mm wide at the base, 0.6 mm wide at the top, star-shaped in outline at base and entirely under the gynostegium, dark-colored, stipe covered by the corona below, partially exposed above between the lobes, lobes truncate at tips and touching the anther bases; anthers rectangular in outline, ca. 0.5 × 1.5 mm, guide rails rounded, parallel, vertical, ca. 0.2 mm long, terminal appendages appressed to margin of style apex, ca. 0.1 × 1.2 mm, white, corpusculum ca. 0.19 × 0.10 mm, sagittate, red-brown, translators ca. 0.23 × 0.15 mm, straight, pollinia ca. 0.70 × 0.29 mm, obovate, sterile and excavated on proximal third; style apex ca. 2.2 mm wide, pentagonal, flat with a slight umbo in center. Follicles and seeds unknown.

Matelea ferruginea is superficially similar to *Matelea velutina* (Schlechtendal) Woodson, from northeastern Mexico, and the original collection had been so determined. This new species, however, is probably more closely related to the also rather similar, and generally sympatric, *Matelea magnifolia* (Pittier) Woodson. *Matelea velutina* shares with the new species a vertically oriented corona surrounding the gynostegium stipe, but the lobes of the outer corona are broad, tangentially oriented and covering the entire stipe, concave, yellow and glistening, rather than narrow, radially compressed and broadest at the base, attenuate above and not completely covering the stipe, dark-colored and dull. The corona of *Matelea velutina* is similar to that of the smaller-flowered *M. reticulata* (Engelmann ex A. Gray) Woodson, from southwestern U.S.A. and adjacent Mexico, and both species have the terminal anther appendages bright, reflective white and covering the entire style apex, forming a distinctive eye in the center of the flower. In contrast, *Matelea magnifolia* and *M. ferruginea* have terminal anther appendages covering only the margin of the style apex and have no re-

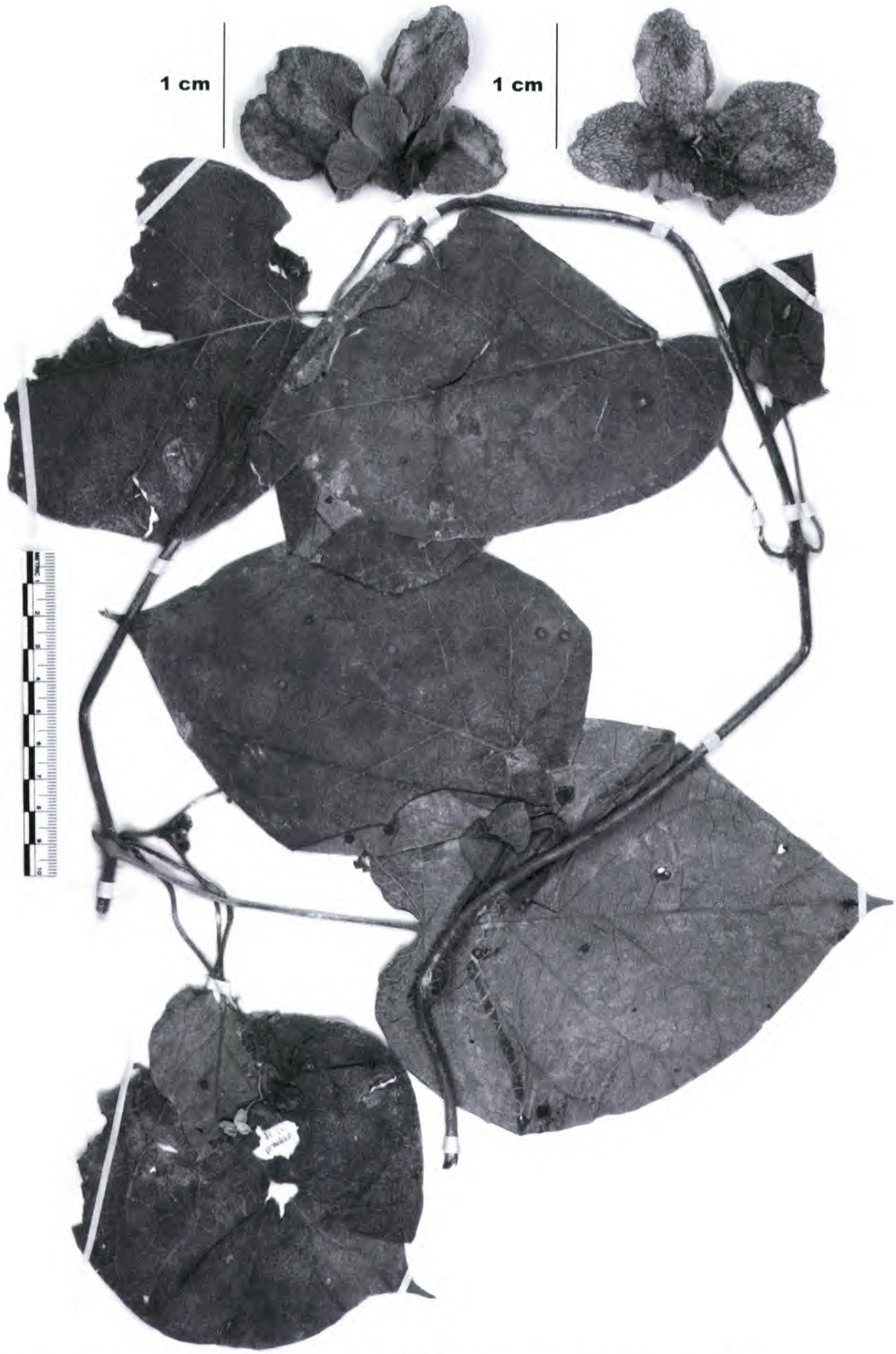

Figure 4. *Matelea ferruginea* W. D. Stevens. Scan of holotype specimen (*Standley 80219*, F).

flective eye; they also share, along with *M. velutinoides*, described below, relatively long glandular trichomes with the terminal cell darker colored but hardly inflated. *Matelea magnifolia* is easily distinguished by having a faucal annulus, an essentially sessile gynostegium and a horizontally oriented, disk-like corona.

Although the Johnston collection is technically a paratype, it was collected at the same place and on the same date as the type collection and may be

Figure 5. *Matelea filipes* W. D. Stevens & Monterrosa. Scan of holotype specimen (*Sandoval 1608*, MO).

part of the original gathering; this species has not been collected in 65 years.

Paratype. GUATEMALA. **Chimaltenango:** Calderas, *J. Johnston 1792* (F).

Matelea filipes W. D. Stevens & Monterrosa, sp. nov. TYPE: El Salvador. Achuachapán: San Francisco Menéndez, cabecera de la vereda La Pinera, 650 m, 13°49'N, 89°56'W, 6 June 1997, *E. Sandoval 1608* (holotype, MO; isotype, LAGU). Figure 5.

Mateleae pinguifoliae et *M. pseudobarbatae* affinis, sed differt ramis inflorescentiae delicatioribus floribus minoribus.

Vine, older stems and base unknown, latex unknown, young stems with mixed indumentum, long trichomes sparse to dense, 1.5–3.5 mm, straight, pale yellow-brown, spreading, short trichomes dense, 0.1–0.15 mm, straight, translucent, glandular trichomes dense, 0.07–0.1 mm, dark brown, internodes 15–20 cm. Leaves opposite, blades ovate,

10.2–14.2 × 6.2–10.8 cm, apex abruptly acuminate, base lobate, lobes convergent to overlapping, sinus 1–2 cm deep, adaxially with mixed indumentum, glandular trichomes sparse, abaxially with dense short and glandular trichomes, lateral veins 6 to 7 pairs, middle veins 40°–45° to midrib, colleters 7 to 10; petiole 5.8–7 cm, with mixed indumentum. Inflorescence congested-racemiform, thin, with mixed indumentum, peduncle 45–77 mm, axis to 5 mm, pedicel 17–24 mm, bracts 1–1.5 × 0.1–0.2 mm, linear; calyx tube ca. 0.5 mm long, with 1 colleter per sinus, lobes lanceolate, ca. 2.2 × 1.2 mm, apex acute, green, with mixed indumentum outside, long trichomes 0.5–1 mm, glabrous inside; corolla briefly campanulate, then rotate, pale brown, with mixed indumentum outside, long trichomes 0.5–1 mm, inside with flexuous, pale yellow trichomes 2–3 mm long, tube ca. 1 mm long, lobes broadly ovate, ca. 2.7 × 2.3 mm, apex rounded and notched, patent; gynostegium sessile, outer corona obconic, circular in outline, glabrous, undulate and darker-colored on distal margin in 2 rings opposite anthers and 1 ring alternate with anthers, margin equaling base of gynostegium, ca. 0.6 mm tall, inner corona of 5 adnate ligules opposite anthers, trapezoidal in outline, lateral margins raised, ca. 0.6 × 0.5 mm, distal margin similar to margin of outer corona, producing 3 layers opposite anthers; anthers trapezoidal in outline, ca. 0.4 × 0.9 mm, tilted under style apex, guide rails straight, parallel, tilted under style apex, ca. 0.1 mm long, terminal appendages appressed to style apex, ca. 0.3 × 0.7 mm, white to translucent, corpusculum ca. 0.19 × 0.11 mm, sagittate, red-brown, translators ca. 0.11 × 0.11 mm, straight, pollinia ca. 0.41 × 0.29 mm, angularly obovate, sterile and excavated at attachment; style apex ca. 1.3 mm wide, slightly pentagonal, nearly round, flat. Follicles and seeds unknown.

Matelea filipes is most closely related to *M. pinguifolia*, from Panama and northern South America, and *M. pseudobarbata*, a rare species endemic to central Costa Rica, with which it shares relatively thin inflorescence branches, relatively small flowers, and a peculiar long, wavy indumentum on the inside of the corolla, although the inflorescence of *M. filipes* is longer (peduncles 45–77 mm vs. 5–25 mm) and even more delicate (pedicels 0.3 mm diam. vs. 0.5–0.7 mm diam.) and the flowers are smaller (calyx lobes 2.2 mm long vs. 2.5–4.1 mm long) than the other two species. Additionally, *Matelea pinguifolia* and *M. pseudobarbata* have a stipitate gynostegium and a more massive, stipitate, and more strongly colored corona, contrasting sharply with the reflexed corolla of this new species. *Matelea haberi* is also similar, and has a sessile gynostegium, but has stouter inflorescences, larger flowers (corolla lobes 3.9–4.8 mm long), and a more dissected corona margin.

Matelea filipes is known only from the type collection from El Salvador. The isotype was studied by the coauthor of the species, Jorge Alberto Monterrosa Salomón.

Matelea gentlei (Lundell & Standley) Woodson, Ann. Missouri Bot. Gard. 28: 234. 1941. Basionym: *Vincetoxicum gentlei* Lundell & Standley, in Standley, Field Mus. Nat. Hist., Bot. Ser. 17: 269. 1937. TYPE: Belize. Belize: Gracie Rock, Sibun River, 31 Jan. 1936, *P. Gentle 1779* (lectotype, designated here, MICH; duplicates of lectotype, A, F, MO, P, US).

The original diagnosis of *Vincetoxicum gentlei* cited "*Lundell*" *1779* and *1780* as the types. Lundell (1938) corrected the collector of the types to *Gentle*. The lectotype is a flowering specimen and the unselected syntype, *P. Gentle 1780* (F, MICH, WIS), has young fruits.

Matelea haberi W. D. Stevens, sp. nov. TYPE: Costa Rica. Puntarenas: Monteverde, Río Guacimal valley, 800 m, 6 Oct. 1984, *W. Haber 650* (holotype, MO). Figure 6.

Mateleae pinguifoliae et *M. pseudobarbatae* affinis, sed statim differt corolla intra glabra.

Vine, older stems and base unknown, latex white, young stems with mixed indumentum, long trichomes sparse to dense, 1.5–3.2 mm, straight, pale yellow, spreading, short trichomes dense, 0.07–0.13 mm, straight, translucent, glandular trichomes sparse to moderately dense, 0.1–0.15 mm, brown to nearly black, internodes 11–30 cm. Leaves opposite, blades ovate to elliptic, 6.2–13 × 3.4–8.6 cm, apex abruptly acuminate, base lobate, lobes descending to overlapping, sinus 0.7–2.4 cm deep, adaxially with dense short trichomes, sometimes with sparse glandular and long trichomes on veins and at base, abaxially with dense short and glandular trichomes, lateral veins 5 to 7 pairs, middle veins 35°–40° to midrib, colleters 6 to 10; petiole 2.4–5.7 cm, with dense short and glandular trichomes, often with sparse to moderately dense long trichomes. Inflorescence racemiform or congested-racemiform, with dense short and glandular trichomes and sparse to dense long trichomes, peduncle 8–25 mm, axis to 10 mm, pedicel 6–14 mm, first bract 5.5–6.8 × 0.3–1 mm, linear, upper bracts 1.7–3.5 × 0.2–0.7 mm; calyx tube 0.3–0.5

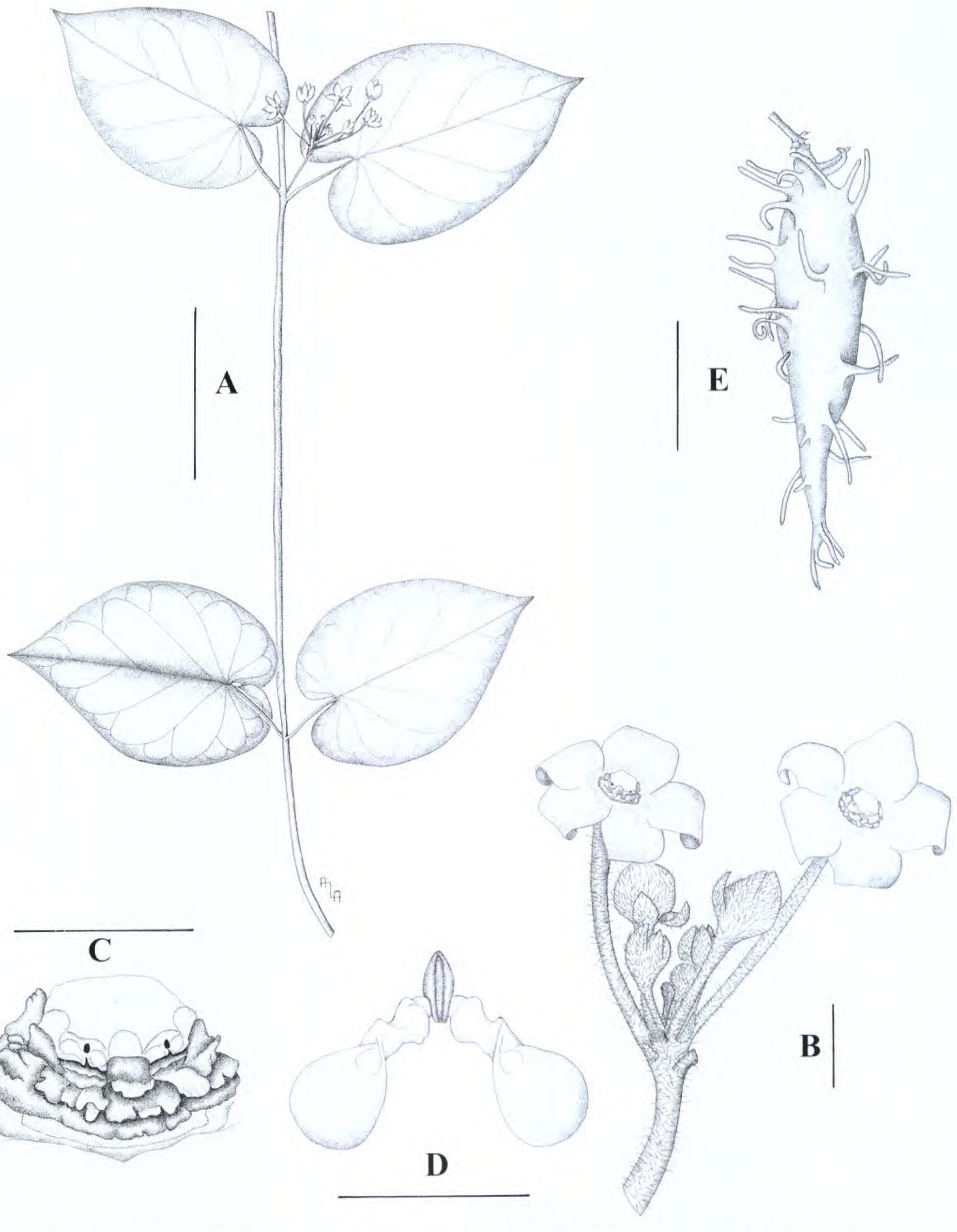

Figure 6. *Matelea haberi* W. D. Stevens. —A. Flowering branch. —B. Inflorescence. —C. Corona and gynostegium. —D. Pollinarium. —E. Nearly mature follicle. A–C drawn from *Espinoza 607* (MO), D drawn from *Haber 199* (MO), E drawn from *Rivera 947* (MO).

mm long, with 1 to 3 colleters per sinus, lobes lanceolate, 2.1–3.1 × 1.1–1.8 mm, apex acute, green, with dense mixed indumentum outside, long trichomes 0.5–1.5 mm, glabrous inside; corolla rotate-reflexed, orange to dark reddish brown, tube 1–1.5 mm long, with mixed indumentum outside, glabrous inside, lobes broadly ovate, 3.9–4.8 × 2.8–3.8 mm, apex rounded and shallowly notched, with dense short and glandular trichomes and sparse to dense long trichomes 0.5–0.7 mm long outside, glabrous inside; gynostegium with stipe 0.3–0.4 mm long, outer corona short-stipitate below, cupuliform above, stipe 0.1–0.2 mm long, cylindrical, with color and texture of corolla, upper part fleshy, glabrous, irregularly divided on outer surface in 2 rings, deep purple, slightly 5-lobed at

base, somewhat shorter than style apex, tube 0.3–0.6 mm long, lobes 0.1–0.2 × 0.3–0.5 mm, inner corona of 5 adnate ligules opposite outer corona lobes and anthers, linear with free truncate or slightly bifid tips incumbent on backs of anthers, free tips 0.3–0.5 × 0.3–0.4 mm; anthers trapezoidal in outline, 0.4–0.5 × 0.8–0.9 mm, tilted under style apex, guide rails straight, parallel, tilted under style apex, ca. 0.1 mm long, terminal appendages appressed to style apex, 0.3–0.4 × 0.7–0.8 mm, white to translucent, corpusculum 0.15–0.2 × 0.07–0.09 mm, sagittate, pale brown, translators 0.1–0.15 × 0.07–0.1 mm, sigmoid, pollinia 0.27–0.35 × 0.22–0.25 mm, asymmetrically obovate, sterile and excavated at attachment; style apex 0.9–1.2 mm wide, slightly pentagonal, nearly round, flat or slightly concave, apparently purple. Follicles divergent when double, fusiform, 8–9 × 1.7–2 cm, green, with dense mixed indumentum, long trichomes to 2 mm long, sometimes sparse, apex long-attenuate, base stipitate, with scattered prickles (1 to 3 per cm², 40 to 50 total), prickles 11–17 mm long, 0.8–1.3 mm wide at middle, tips often clavate, bifid or geniculate; seeds obovate, 7–7.7 × 4.8–4.9 mm, yellow-brown, margin 0.6–0.7 mm wide, irregularly crenate on distal third to two-thirds, surface slightly reticulate-rugose, coma 2.5–3 cm long, white.

Matelea haberi is most closely related to *M. pinguifolia*, *M. pseudobarbata*, and *M. filipes*, but differs most conspicuously in having the inside of the corolla glabrous; it also has denser inflorescences, a more prominently lobed corona, and smaller pollinia (0.27–0.35 × 0.22–0.25 mm vs. 0.40–0.53 × 0.28–0.30 mm) and style apices (0.9–1.2 mm vs. 1.7–2.5 mm). The follicles of *Matelea haberi* have longer prickles (11–17 mm vs. 7–11 mm) and shorter trichomes (to 2.0 mm vs. to 3.5 mm) than those of *M. pinguifolia* and *M. pseudobarbata*.

Matelea haberi is known only from cloud forests in the volcanic mountains of northwestern Costa Rica at 760 to 1550 m elevation, and it flowers and fruits from July to January.

Paratypes. COSTA RICA. **Guanacaste:** P.N. Rincón de la Vieja, Est. Las Pailas, *R. Espinoza 607* (CR, INB, MO), *D. García 36* (MO); Monteverde, *A. Gentry, W. Haber, L. Woodruff & B. Boyle 71600* (MO); P.N. Rincón de la Vieja, Hda. Sta. María, *J. Gómez L. 10312* (F); P.N. Rincón de la Vieja, sector Los Naranjos, camino a San Jorge, *G. Rivera 947* (MO). **Puntarenas:** Monteverde, *W. Haber 199* (MO), *581* (MO).

Matelea insolita W. D. Stevens, sp. nov. TYPE: Nicaragua. Estelí: Reserva Natural Miraflor, Comarca Sontule, 1000–1100 m, 13°12'N, 86°20'W, 7 July 1999, *R. Rueda, I. Coronado, W. Velásquez & M. Arroliga 11427* (holotype, MO; isotype, HULE). Figure 7.

Ex affinitate *Mateleae pinguifoliae* et specierum affinium corona externa tenui alba quam corona interna breviori confestim distinguenda.

Vine, older stems and base unknown, latex unknown, young stems with mixed indumentum, long trichomes sparse, 0.4–2 mm, straight, yellow-brown, spreading, short trichomes dense, 0.1–0.2 mm, straight, white, glandular trichomes dense, ca. 0.1 mm, dark brown, internodes 10–16 cm. Leaves opposite, blades ovate, 6.8–12.1 × 3.6–7 cm, apex abruptly acuminate to attenuate, base lobate, lobes descending to convergent, sinus 0.6–1.6 cm deep, adaxially with dense short trichomes and a few glandular trichomes at base of midrib, abaxially with dense short and glandular trichomes, lateral veins 5 to 7 pairs, middle veins 35°–45° to midrib, colleters 10 to 20; petiole 3.6–6.9 cm, with dense short and glandular trichomes. Inflorescence congested-racemiform, with mixed indumentum, long trichomes sparse, peduncle 10–25 mm, axis to 5 mm, pedicel 15–35 mm, bracts 1.5–1.8 × 0.3–0.4 mm, linear or narrowly lanceolate; calyx tube 0.5–0.8 mm long, with 1 colleter per sinus, lobes lanceolate, 3.1–3.5 × 1.2–1.3 mm, apex acute, green, with mixed indumentum outside, long trichomes sparse, 0.3–0.5 mm, glabrous inside or hispidulose at tip; corolla briefly campanulate, then rotate, yellowish, with mixed indumentum outside, long trichomes sparse, 0.3–0.8 mm, inside with flexuous, white trichomes 0.8–1.2 mm long in tube and base of lobes, tube ca. 2.5 mm long, lobes lanceolate, 5.7–6.5 × 3.5–3.6 mm, apex rounded and notched, patent; gynostegium sessile, outer corona laminar, flat, horizontal, dull white, 5-lobed, entirely hidden under gynostegium, tube ca. 0.2 mm long, lobes ca. 0.4 × 0.9 mm, irregularly toothed, inner corona of 5 adnate ligules opposite anthers, rectangular in outline, fleshy, purple-black, ca. 0.8 × 0.6 mm, tips bifid and appressed to anther backs; anthers elliptic in outline, ca. 0.5 × 1.1 mm, guide rails straight, parallel, slightly tilted under style apex, ca. 0.1 mm long, terminal appendages appressed to margin of style apex, ovate, ca. 0.3 × 0.8 mm, translucent, corpusculum ca. 0.18 × 0.08 mm, sagittate, red-brown, translators ca. 0.11 × 0.09 mm, straight, pollinia ca. 0.35 × 0.16 mm, asymmetrically obovate, sterile and excavated on proximal two-thirds; style apex ca. 1.4 mm wide, slightly

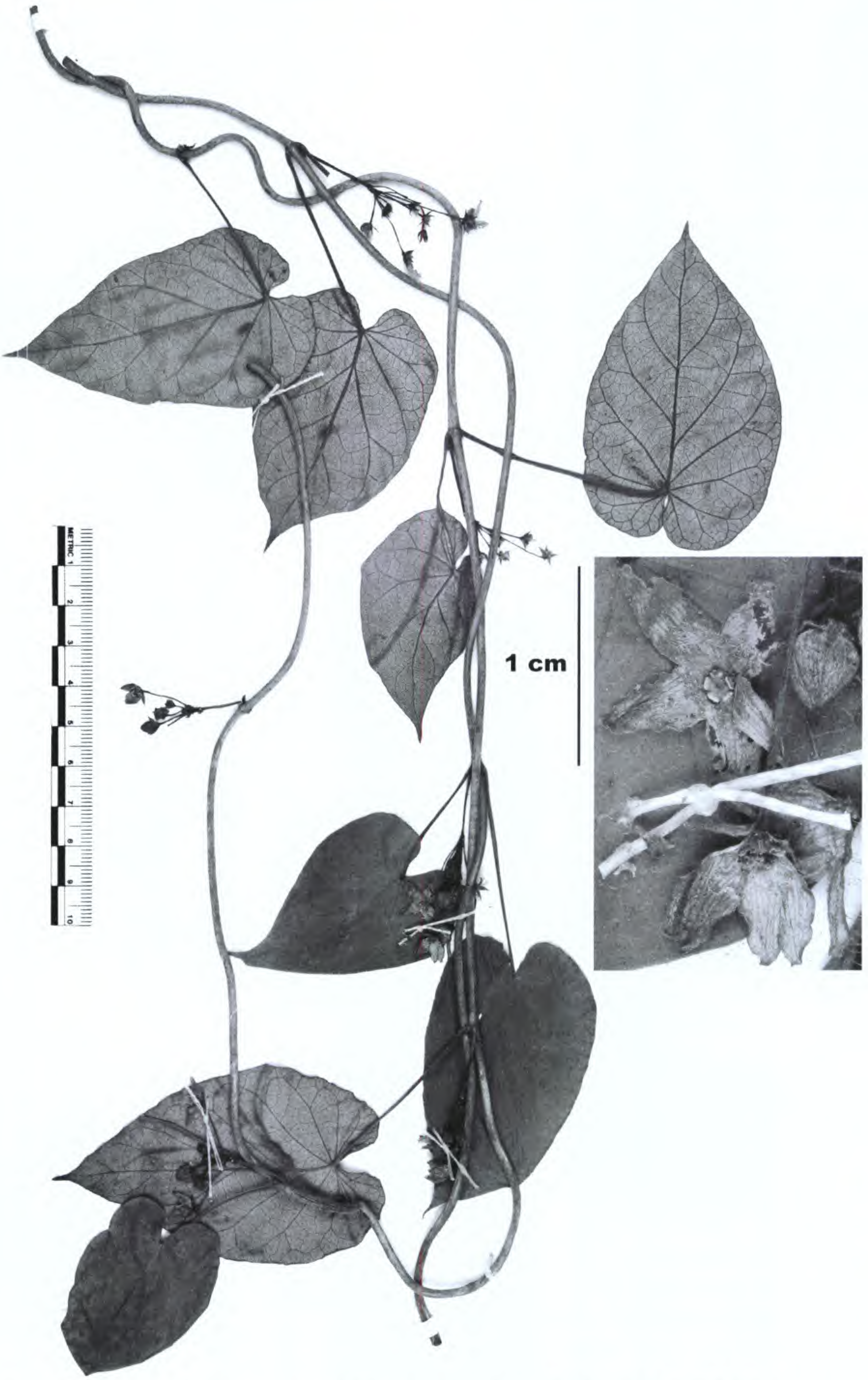

Figure 7. *Matelea insolita* W. D. Stevens. Scan of holotype specimen (*Rueda et al. 11427*, MO).

pentagonal, nearly round, shallowly concave. Immature follicles fusiform, to 13.5 × 2.5 cm, green, with dense short and glandular trichomes, apex long-attenuate, base stipitate, with more or less dense prickles (ca. 4 per cm^2, ca. 150 total), prickles 20–30 mm long, 0.6–1.2 mm wide at middle, tips sometimes slightly clavate; seeds unknown.

Matelea insolita is clearly of the *M. pinguifolia* alliance, which shares nearly symmetrical fusiform

follicles that have relatively sparse long, thin, curved prickles and a dense mixed indumentum, and which ranges from Mesoamerica to northern South America. *Matelea insolita* is vegetatively quite similar to *M. pinguifolia*, but is the only species of the alliance, and perhaps in the whole genus, where the outer corona is white and practically vestigial and the inner corona is prominent. *Matelea insolita* has only been found in northern Nicaragua, between 900 and 1100 m elevation. The flowers were collected in July and the nearly mature fruits in January.

Paratype. NICARAGUA. **Jinotega:** R.N. Kilambé, Santa Teresa de Kilambé, *R. Rueda, D. Paguaga, H. Mendoza, A. Rivera, N. Toval & M. Garmendia 15591* (HULE, MO).

Matelea velutinoides W. D. Stevens, sp. nov. TYPE: Mexico. Chiapas: Mpio. Cintalapa, SE of Cerro Baul on border with Oaxaca, 16 km NW of Rizo de Oro along logging road to Colonia Figaroa, 1600 m, 6 Sep. 1972, *D. Breedlove 27642* (holotype, MO). Figure 8.

Mateleae velutinae affinis, sed lobis coronae radiantibus lobis corollae intra ad marginem hispidulosis distinguenda.

Vine, older stems and base unknown, latex white, young stems with mixed indumentum, long trichomes sparse to dense, 1.5–2.5 mm, straight, yellow to brown, spreading, short trichomes dense, 0.2–0.5 mm, straight, yellow to brown, glandular trichomes dense, 0.2–0.5 mm, stalks pale brown, tips black-brown, hardly or not at all inflated, internodes 12–20 cm. Leaves opposite, blades ovate to elliptic, 9.8–13.8 × 4.8–7.2 cm, apex acuminate, base lobate, lobes descending to overlapping, sinus 0.7–1.3 cm deep, adaxially hispid, trichomes 0.5–1.5 mm, pale brown, short and glandular trichomes present on midrib, abaxially hispid, trichomes 0.5–1.5 mm, short and glandular trichomes present on veins and sometimes on surface, lateral veins 6 to 8 pairs, middle veins 35°–45° to midrib, colleters 10 to 24, thin, with light colored tips; petiole 3.7–5.5 cm, with mixed indumentum. Inflorescence racemiform or congested-racemiform, with mixed indumentum, peduncle 35–95 mm, axis to 11 mm, pedicel 9–24 mm, bracts to 9 × 2 mm, lanceolate; calyx tube 0.5–1 mm long, with 1 colleter per sinus, lobes elliptic, unequal, flat or somewhat cucullate, 4.3–6 × 2.3–4 mm, apex rounded to acuminate, green, with mixed indumentum outside, long trichomes 1–2.5 mm, sometimes restricted to distal half, glabrous inside or with scattered glandular trichomes; corolla very briefly campanulate then rotate, brown to yellowish orange, reticulate when dried, with mixed indumentum outside, long trichomes 0.5–1 mm, glabrous inside except inconspicuously hispidulose in a narrow band along 1 margin of each lobe, sometimes extending into tube, trichomes 0.05–0.1 mm, translucent, tube 3.2–3.6 mm long, lobes broadly elliptic, somewhat asymmetric, 6.2–7.1 × 5.7–7.4 mm, apex rounded and shallowly notched; gynostegium with stipe 0.9–1.1 mm long, outer corona entire or shallowly 5-lobed at base, base horizontal and overlapping the corolla, erect above and entirely enclosing gynostegium stipe, fleshy, with radial crests, 0.8–1.2 mm tall, 0.7–1.1 mm wide at the base, dark-colored, inner corona borne on outer corona, erect, forming radial wings on upper part of outer corona, lighter-colored, 0.5–0.6 × 0.3–0.4 mm, tips touching the anther bases; anthers rectangular in outline, 0.5–0.7 × 1.4–1.5 mm, guide rails rounded, parallel, somewhat tilted under style apex, 0.15–0.2 mm long, terminal appendages appressed to style apex and covering about half of surface, 0.5–0.8 × 1–1.4 mm, white, corpusculum 0.23–0.25 × 0.09 mm, sagittate, red-brown, translators 0.19–0.25 × 0.14–0.15 mm, straight, pollinia 0.65–0.69 × 0.25–0.29 mm, obovate, sterile and excavated in proximal third; style apex 2.1–2.6 mm wide, pentagonal, flat or slightly concave when dry, with a slight umbo in center. Follicles and seeds unknown.

Matelea velutinoides is superficially similar to *Matelea velutina*, from northeastern Mexico, and most of the collections were distributed under this name. *Matelea velutinoides* has the corona oriented horizontally below and vertically above, but the vertical part is dark-colored and radially oriented, rather than yellow and tangentially oriented, as in *M. velutina*. *Matelea velutina* also has larger (to 15.1 × 11 cm vs. to 13.8 × 7.2 cm) and proportionately broader leaves, larger flowers (corolla lobes 7.1–10.0 mm long vs. 6.2–7.1 mm long), corollas that are entirely glabrous within, and terminal anther appendages that entirely cover the style apex. *Matelea velutinoides* differs from *M. ferruginea* in having a spreading, mixed indumentum on the outside of the calyx and corolla, rather than a simple appressed indumentum, and in the corona covering the entire gynostegium stipe.

Matelea velutinoides is known from cloud forest in Chiapas and Guatemala between 1600 and 2200 m elevation and is known to flower between April and September.

Paratypes. MEXICO. **Chiapas:** Mpio. Motozintla, 15 km al O de Motozintla, camino a Siltepec, *E. Martínez S.*

Figure 8. *Matelea velutinoides* W. D. Stevens. Scan of holotype specimen (*Breedlove 27642*, MO).

et al. 20741 (MO); Carelas, *E. Matuda 15517* (F); Mpio. Escuintla, Cacaluta, *E. Matuda 17001* (F, MEXU); Mpio. Siltepec, Cascada, *E. Matuda 17842* (F); Cerro del Boqueron, *C. Purpus 7277-B* (F); Mpio. Motozintla, El Rosario, *E. Ventura & E. López 3935* (F). GUATEMALA. **El Quiché:** falls of Río de las Violetas, 2.5 mi. N of Nejab, *G. Proctor 25445* (CAS, F, TEX).

Pherotrichis schaffneri A. Gray, Syn. Fl. N. Amer. (ed. 2) 2(1): 462. 1886. TYPE: Mexico. "Northern Mexico," *J. Schaffner 63* (lectotype, designated here, GH; duplicate of lectotype, K).

Gray (1886a) validly, but minimally, published

Pherotrichis balbisii (see below) and *P. schaffneri*, where he cites the earlier written, but later published, fuller treatment (Gray, 1886b). Gray intentionally and specifically placed one syntype of *Gonolobus pogonanthus* (see below) (*Ghiesbreght 670*) in his *Pherotrichis balbisii* and the other (*Parry & Palmer 586*) in his *P. schaffneri*, thereby effectively lectotypifying the Hemsley name with the Ghiesbreght specimen and placing it in synonymy of his superfluous *P. balbisii* (= *P. villosa* (Schultes) Meisner). The unselected syntypes of *Pherotrichis schaffneri* are: *C. Parry & E. Palmer 586* (syntype, GH; isosyntypes, K, MO) and *J. Lemmon 2816* (syntype, GH). *Pherotrichis schaffneri* is almost certainly a species distinct from *P. villosa* (Schultes) Meisner and the lectotypification stabilizes that usage.

Pherotrichis villosa (Schultes) Meisner, Pl. Vasc. Gen. 2: 176. 1840. *Cynanchum villosum* Schultes, in Roemer & Schultes, Syst. Veg. 6: 103. 1820, based on *Asclepias villosa* Balbis, Mem. Acad. Sci. Turin, Sci. Phys. 7: 331, t. 4. 1803–4, not *A. villosa* P. Miller, 1768. TYPE: unknown provenance cultivated at the Turin botanical garden, *G. Balbis s.n.* (holotype, TO, not seen; isotypes: G, MO).

Gonolobus pogonanthus Hemsley, Biol. Cent.-Amer., Bot. 2(11): 333. 1882. TYPE: Mexico. Chiapas, 1864–1870, *A. Ghiesbreght 670* (lectotype, designated by Gray, Proc. Amer. Acad. Arts 21: 400. 1886, K; duplicate of lectotype, GH).

Pherotrichis Decaisne was validly published (Decaisne, 1838), but the combination based on the only included species, *Asclepias villosa* Balbis, now known to be a later homonym of *A. villosa* P. Miller, was not made. Later, Decaisne (1844) included *Pherotrichis* in his concept of *Lachnostoma* and published the name *L. balbisii* Decaisne (in A. de Candolle, Prodr. 8: 602. 1844), a superfluous name based on *Asclepias villosa* Balbis. The names *Pherotrichis villosa* (Schultes) K. Schumann (in Engler & Prantl, Nat. Pflanzenfam. 4(2): 303. 1895), *P. balbisii* A. Gray (Syn. Fl. N. Amer. (ed. 2) 2(1): 462. 1886), and *Matelea balbisii* Woodson (Ann. Missouri Bot. Gard. 28: 231. 1941) are likewise based on *Asclepias villosa* Balbis and superfluous. The species has generally been treated as *Matelea balbisii* (Standley & Williams, 1969; Breedlove, 1986) and *Pherotrichis balbisii* (Stevens, 2001), but the overlooked *Pherotrichis villosa* (Schultes) Meisner must be used for the species when placed in the genus *Pherotrichis*. *Asclepias villosa* Balbis was described from material of unknown provenance cultivated at the Turin botanical garden and specimens apparently distributed by Balbis (e.g., a specimen at G: "misit Balbis 1805, non indigena pedem., in ho. T culta") are taken to be type material.

Polystemma guatemalense (Schlechter) W. D. Stevens, comb. nov. Basionym: *Labidostelma guatemalense* Schlechter, in Loesner, Bull. Herb. Boissier, sér. 2, 6: 843. 1906. TYPE: Guatemala. Huehuetenango: Nentón, Sep. 1887, *C. Seler & E. Seler 3279* (lectotype, designated here, F).

Vincetoxicum quirosii Standley, Publ. Field Mus. Nat. Hist., Bot. Ser. 18: 959. 1938. Syn. nov. *Matelea quirosii* (Standley) Woodson, Ann. Missouri Bot. Gard. 28: 224. 1941. TYPE: Costa Rica. Puntarenas: Manzanillo, 22 June 1937, *M. Quirós C. 732* (holotype, F).

Polystemma Decaisne has long been considered a synonym of *Matelea* Aublet but was resurrected by Stevens et al. (2001) for the single species *P. viridiflorum* Decaisne. The only other names attributed to the genus, *Polystemma rupestre* Brandegee and *P. scopulorum* Brandegee are considered by this author to be synonyms of *P. viridiflorum*. This is thus the second species of *Polystemma*; however, about 18 additional Mexican species, currently placed in *Matelea*, will be added in a fuller taxonomic treatment. Species of *Polystemma* can be distinguished from those of the current concept of *Matelea* by having glandular trichomes that are initially translucent but turn white and crystalline with age, while those of *Matelea*, when present, are red, yellow, brown, or black and do not become crystalline. The glandular trichomes of the related genus *Dictyanthus* are also translucent but remain translucent. The follicles of *Polystemma* are long, thin, symmetrical, smooth, and mottled, states individually rare or non-existent in *Matelea* and never found in this combination. The distal-dorsal margin of the outer corona of *Polystemma* is usually provided with long, filiform appendages, although these can be short in some species or, in the case of *Polystemma guatemalense*, stout.

The holotype of *Labidostelma guatemalense* was at B and is no longer extant. A fragment of the holotype at F, although small, serves as an adequate lectotype.

Acknowledgments. Alba Arbeláez prepared the line drawings and Fred Keusenkothen and Brigham Fisher prepared the images. Amy Pool improved the manuscript, especially the nomenclatural and bibliographic details. Gordon McPherson and Victoria Hollowell provided helpful comments.

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Novelties in *Cynanchum* L., sensu Woodson, in Mesoamerica

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ABSTRACT. Eleven species and one genus from Mesoamerica are described as new and four new combinations are provided for taxa previously included in *Cynanchum* (Apocynaceae, Asclepiadoideae) from Mesoamerica. *Liedea* is newly described to accommodate *L. filisepala*. *Cynanchum surrubriflorum*, *Metastelma brachymischum*, *M. thalamosiphon*, *M. thysanotum*, *M. triodontum*, *M. yucatanense*, *Orthosia cynanchoides*, *O. extra-axillaris*, *O. ramosa*, *O. smaragdina*, and *O. stipitata* are described. Combinations are provided for *Orthosia glaberrima*, *O. misera*, and *O. rubens*.

Key words: Apocynaceae, Asclepiadoideae, *Cynanchum*, *Liedea*, *Metastelma*, *Orthosia*, Mesoamerica.

Fishbein and Stevens (2005 this issue) discuss the rationale and consequences of the disarticulation of Woodson's (1941) concept of New World *Cynanchum* L. Although the process is now well under way, there are still many uncertainties in the generic circumscriptions. In providing names for an upcoming volume of *Flora Mesoamericana*, I mirror the approach of Rapini (2002) for South American taxa, in gradually realigning the species into genera that better reflect our current understanding of relationships but without breaking the bonds of traditional morphology.

Cynanchum L., Sp. Pl. 1: 212. 1753. TYPE: *Cynanchum acutum* L.

It now seems clear that, in the New World, *Cynanchum* is represented only by *Cynanchum* subgen. *Mellichampia* Woodson (e.g., Rapini et al., 2003), a group of about 15 species ranging through North and South America. This new species fits easily into that group.

1. Cynanchum surrubriflorum W. D. Stevens, sp. nov. TYPE: Mexico. Tabasco: Macuspana, Falda del Cerro de Macuspana, al E de la planta de Cal, Km 2.2 de la carretera, 75 m, 17 June 1979, *C. Cowan 2326* (holotype, MO; isotypes MO, TEX). Figure 1.

Cynancho jaliscano affinis sed antheris angustioribus alis brevioribus caudiculis brevioribus differt.

Twining vines, lower stems and base unknown, latex white; young stems tomentulose at the nodes and in 1 line on the internodes, trichomes 0.1–0.2 mm long, recurved, ferrugineous, internodes 8–9 cm. Leaves opposite, apparently without pseudostipules, blades ovate, 8.4–12.5 × 4.6–5.8 cm, apex acuminate, base shallowly lobate, sinus to 0.6 mm deep, glabrous or with a few scattered trichomes on the veins, lateral nerves 4 or 5 pairs, middle veins 40°–50° to midrib, colleters 3 to 5; petioles 4.5–6.1 cm, tomentulose on adaxial surface. Inflorescence extra-axillary, 1 per node, racemiform, many-flowered, tomentulose on 1 side, peduncle 1.2–5.4 cm, axis to 5 cm, pedicel 6.8–8 mm, bracts 0.4–1.5 × 0.2–0.5 mm, deltate to lanceolate; calyx with 1 colleter below each sinus within, lobes elliptic with obtuse tips, 1.7–2.3 × 0.6–1 mm, glabrous or inconspicuously tomentulose at base abaxially, ciliolate, trichomes ca. 0.2 mm long, glabrous inside, green with a purple tint; flower buds conical, somewhat apiculate; corolla rotate or slightly campanulate, glabrous, white with a pink tint, tube 0.2–0.6 mm long, lobes lanceolate, with 2 submarginal fleshy ridges, tips rounded, nearly truncate, erect then spreading from above the middle, 3.1–5 × 1.3–1.7 mm; gynostegium with stipe 0.3–0.4 mm long (from base to inflated anther back), ribbed, corona borne at base of stipe, tube 0.2–0.4 mm long, the 5 free lobes laminar, trilobulate, 4–5.2 mm long, body of each lobe elliptic, 1.6–2 × 0.8–1.3 mm, lateral lobules ca. 0.4 mm long, central lobule narrowly deltate, nearly linear, twisted, terminal anther appendages ovate-retuse, 0.5–0.7 × 0.8–0.9 mm, inclined toward style apex, white, anthers T-shaped in outline, 0.8–1 × 1 mm, guide rails rounded, vertical, ca. 0.2 mm long; pollinaria pendent, corpusculum 0.1–0.19 × 0.11–0.13 mm, ellipsoid or subsagittate, dark red-brown, translators 0.31–0.33 × 0.06 mm, horizontal, slightly flattened, slightly geniculate, red-brown, pollinia 0.73–0.74 × 0.15–0.21 mm, narrowly obovoid; style apex 1.5–1.8 mm wide, slightly convex, densely papillate. Follicles and seeds unknown.

Figure 1. *Cynanchum surrubriflorum* W. D. Stevens. Photograph of branch and opened flower of *Cowan 2326* (holotype, MO).

This new species is most closely related to *Cynanchum jaliscanum* (Vail) Woodson, with which it shares a stipitate gynostegium, short guide rails, and long, horizontal, pigmented translators. When Sundell (1981) treated *Cynanchum jaliscanum*, there were available for study only the three original syntype collections from Mexico, two from Jalisco and one from Veracruz, and one additional collection from Nayarit. There are now 16 collections available, not counting the Veracruz collection, and all range from Nayarit to Michoacán at 770–1400 m elevation, making the Veracruz collection, *Botteri*

s.n., relatively more anomalous than it might have seemed to Sundell. On closer examination, the Veracruz collection, with the ambiguous locality "Orizaba," generally matches a collection from lowland Tabasco, the type designated here for *Cynanchum surrubriflorum*. In addition to the difference in elevation, as far as known, and obvious geographical distinction, and it is rare for non-weedy milkweeds to occur on both sides of Mexico, *Cynanchum surrubriflorum* differs from *C. jaliscanum* in its shorter corolla tube, 0.2–0.6 mm versus 0.6–2 mm, shorter gynostegium stipe, 0.3–0.4 mm versus 0.4–0.8 mm, narrower corona lobes, 0.8–1.3 mm versus 1.3–1.9 mm, narrower anthers, 1.0 mm versus 1.3–1.9 mm, shorter guide rails, 0.2 mm versus 0.3–0.5 mm, and shorter translators, 0.31–0.33 mm versus 0.53–0.64 mm. While most of the differences are not individually dramatic, the totality suggests recognition of the east coast lowland species as distinct from the west coast upland species, *Cynanchum jaliscanum*, and the two are relatively easily distinguished from the other species of *Cynanchum*.

Paratype. MEXICO. **Veracruz:** Orizaba, 1850–1874, *M. Botteri s.n.* (GH, NY).

Liedea W. D. Stevens, gen. nov. TYPE: *Liedea filisepala* (Standley) W. D. Stevens.

A *Cynancho* sect. *Microphyllo* Liede inflorescentiis pedunculatis paniculiformibus caulibus aequabiliter pubescentibus recedit.

Twining perennial vines with sympodial branching, apparently woody but not corky below, latex white; stems uniformly pubescent with multicellular trichomes of uniform length. Leaves opposite, without pseudostipules, small, ovate, petiolate. Inflorescence extra-axillary, 1 per node, pedunculate, cymose, fundamentally paniculiform but with some axes reduced to produce apparently racemiform inflorescences with 4 flowers and 1 axis per inflorescence node or all axes reduced and nearly umbelliform. Calyx connate at base, with colleters below sinuses within; corolla campanulate, glabrous within, aestivation imbricate and dextrorse; gynostegium short-stipitate, corona borne on gynostegium stipe, laminar, connate below, briefly 5- or 10-lobed distally; anther connectives dorsally thickened and convex, terminal appendages appressed to style apex; pollinia pendent, uniformly fertile, translators delicate, round in section, without appendages, corpuscula triangular in outline; style apex shallowly convex, smooth. Follicles apparently single, fusiform, symmetrical, thin-walled, smooth; seeds elongate, cucullate, with an entire wing, surface smooth, comose.

1. **Liedea filisepala** (Standley) W. D. Stevens, comb. nov. Basionym: *Metastelma filisepalum* Standley, Publ. Field Mus. Nat. Hist., Bot. Ser. 18: 956. 1938. *Cynanchum filisepalum* (Standley) L. O. Williams, Fieldiana, Bot. 32: 36. 1968. TYPE: Costa Rica. Alajuela: entre San Ramón y La Palma de San Ramón, 30 June 1928, *A. Brenes 6179* (holotype, F).

Liede (1997) placed *Cynanchum filisepalum*, from Costa Rica and Ecuador, in *Cynanchum* sect. *Microphyllum* Liede, along with nine high-altitude northern Andean species. This section was defined primarily by the "dichasial" branching pattern, unbearded corollas, and single follicles. The molecular study of Liede and Täuber (2002) suggests that Woodson's (1941) concept of New World *Cynanchum* is untenable and that *Cynanchum* sect. *Microphyllum* can no longer be included in the current concept of the genus *Cynanchum*. At the generic level, the name available for *Cynanchum* sect. *Microphyllum* is *Scyphostelma* Baillon (Liede & Meve, 2004). However, it seems clear to this author that *Cynanchum filisepalum* does not belong with the other nine species in *Scyphostelma* and *Liedea* is here described as new with but one species, although the generic description is prepared to accommodate several apparently undescribed species from northern South America.

The sympodial branching pattern of *Liedea*, and the remaining species of *Cynanchum* sect. *Microphyllum*, is shared with many species of the related genera *Ditassa* R. Brown, *Orthosia* Decaisne, *Stenomeria* Turczaninow, and *Tassadia* Decaisne. This branching pattern is characterized by twining, indeterminate, more or less sterile shoots with long internodes and more or less non-twining, determinate, fertile, lateral branches with short internodes and distichous leaves; in the extreme, especially in *Stenomeria* and *Tassadia*, the lateral branches become leafless and appear to be inflorescences. *Liedea* differs from the remainder of *Cynanchum* sect. *Microphyllum* in inflorescence structure, stem indumentum, and habit. The other nine species have sessile, fasciculate inflorescences, while those of *Liedea* are pedunculate and paniculiform. The typical milkweed racemiform inflorescence, as for example in *Cynanchum* sect. *Mellichampia* Sundell, has two flowers and one continuing axis at each node, while a paniculiform inflorescence has one flower and two axes, or even three axes and no flowers, at each node. *Liedea* has three or four flowers and one axis at each node, but on close examination one or two of the flowers are borne on reduced axes; thus it is a paniculiform inflores-

cence with the general appearance of a racemiform one. *Liedea* has stems that are uniformly pubescent, while the species of *Cynanchum* sect. *Microphyllum* that I have been able to examine have the indumentum confined to one or two lines. *Liedea filisepala* seems to be a high-climbing liana in cloud forest at 1000–1500 m in Costa Rica (e.g., *A. Skutch 3165*, MO), Panama (e.g., *N. Hensold 1018*, MO), and Ecuador (e.g., *A. Gentry & G. Shupp 26377*, MO), while the other species of *Cynanchum* sect. *Microphyllum* seem to be low herbs or subshrubs in open vegetation at 2300–4200 m in the northern Andes from Venezuela to Peru.

Metastelma R. Brown, Asclepiadeae 41. 1810. TYPE: *Metastelma parviflorum* (Swartz) R. Brown ex Schultes.

Metastelma, as represented by the type, is relatively easily circumscribed in North America, Central America, the Caribbean, and northern South America, and has been accepted in most modern floristic treatments. The inclusion of a disjunct group of species from southern South America, however, is more problematical and has led some authors, e.g., Rapini (2002), Rapini et al. (2003), and Liede-Schumann et al. (2005), to question the genus as a whole. Five new species of *Metastelma* in the sense of the type species are described below.

1. Metastelma brachymischum W. D. Stevens, sp. nov. TYPE: Mexico. Chiapas: El Sumidero, 22 km N of Tuxtla Gutiérrez, 1350 m, 19 Aug. 1972, *D. Breedlove 27183* (holotype, MO). Figure 2.

A speciebus *Metastelmatis* stipitibus brevibus et coronis laminaribus terminalibus haec lobis coronae integris trichomatibus corollae longioribus inflorescentiae brevioribus distinguenda.

Twining vines, woody and corky below, cork brown, latex unknown, underground parts unknown; young stems puberulent on 1 side with recurved white trichomes 0.1–0.2 mm long, internodes 1–3 cm. Leaves opposite, without pseudostipules, blades elliptic to ovate, 2.3–4.1 × 0.7–1.2 cm, apex acute to acuminate, apiculate, base obtuse to rounded, adaxially glabrous except inconspicuously puberulent on midrib and margin, abaxially glabrous, lateral nerves 10 to 12 pairs, middle veins 40–45° to midrib, colleters 0 to 2; petioles 2–4 mm, puberulent on adaxial margin. Inflorescence extra-axillary, 1 per node, sometimes aggregated on short leafless shoots, congested-racemiform, 10- to 20-flowered, peduncle 0.5–1 mm, puberulent on 1 side, axis to 3 mm, thickened by a tight spiral of pedicel bases, pedicel 0.5–1 mm, puberulent on 1 side, sulcate when dry, bracts 0.2–0.4 × 0.1–0.3 mm, ovate; calyx with 1 colleter below each sinus within, lobes ovate with rounded tips, 0.7–0.8 × 0.6–0.7 mm, puberulent at base abaxially, ciliolate, glabrous inside, green to purple with scarious margins; corolla campanulate, white, tube 0.8–1 mm long, glabrous, lobes lanceolate with acute tips, erect, 1.7–1.8 × 0.9–1 mm, abaxially glabrous, adaxially with marginal trichomes erect, white, unicellular, 0.3–0.5 mm long distally, becoming 0.15–0.2 mm long proximally, not reaching base of lobes, and with center trichomes dense, retrorse, translucent, unicellular, 0.25–0.35 mm long; gynostegium with stipe 0.4–0.5 × 0.5–0.7 mm, broadly winged, corona lobes borne at or near top of stipe, lanceolate with attenuate tips, laminar, loosely appressed to anthers and meeting over style apex, free part 0.8–1 × 0.2–0.4 mm, terminal anther appendages ovate, 0.3–0.35 × 0.3–0.4 mm, erect or inclined toward style apex, white, anthers quadrate in outline, 0.3–0.4 × 0.5–0.55 mm, guide rails straight, at ca. 45° to gynostegium axis, salient at base, ca. 0.25 mm long; pollinaria pendent, corpusculum 0.17–0.19 × 0.06–0.07 mm, obovoid, pale brown, translators 0.06–0.09 mm, flattened, bent at middle, pollinia 0.17–0.19 × 0.07–0.09 mm, obovoid with a narrow neck; style apex 0.6–0.8 mm wide, strongly convex, ca. twice the height of corpuscula. Follicles and seeds unknown.

Metastelma brachymischum is not obviously related to any other species in the genus. It shares the general shape of the pollinaria and corona with the rather polymorphic and widespread *Metastelma schlechtendalii* Decaisne, but that species has a proportionally shorter corolla tube (about a quarter of the total corolla length vs. about half), corolla lobes with a pair of submarginal fleshy ridges, shorter corolla trichomes (center trichomes 0.05–0.12 mm vs. 0.25–0.35 mm), a nearly flat style apex, and longer inflorescences (1–15 mm vs. 1–3 mm), among other characters. The guide rails of this new species are similar to those of *Metastelma chiapense* A. Gray, *M. liesnerianum* (L. O. Williams) Liede, *M. longicoronatum* (L. O. Williams) Liede, and *M. thalamosiphon* W. D. Stevens, described below, but each of those species is different in a variety of characters. Liede and Meve (2004) cite a duplicate of the holotype of *Metastelma brachymischum, Breedlove 27183* (TEX), under *Metastelma longicoronatum*, which is also endemic to Chiapas at similar elevations, but that species has 3-lobulate rather than entire corona lobes, a rare char-

Figure 2. *Metastelma brachymischum* W. D. Stevens. Photograph of branch and opened flower of *Breedlove 14010* (F).

acter shared only with *Metastelma triodontum* (described below) among North and Central American species of *Metastelma*, in addition to other differences; perhaps the Breedlove collection is mixed. The same authors cite a duplicate of the paratype, *Breedlove 14010* (TEX), as *Metastelma barbigerum* var. *liesnerianum* (L. O. Williams) Liede & Meve, but that concept is described below as *M. thalamosiphon*.

Metastelma brachymischum has been collected

only in the vicinity of El Sumidero, in seasonal evergreen forest on limestone, at 1200–1350 m elevation, and flowering in August and October.

Paratype. MEXICO. **Chiapas:** 17 km N of Tuxtla Gutiérrez along road to El Sumidero, *D. Breedlove 14010* (F).

2. Metastelma thalamosiphon W. D. Stevens, sp. nov. TYPE: Belize. Western Hwy., 12.5 mi. W of Belize, 10 Aug. 1970, *J. Wiley 193* (holotype, MO). Figure 3.

A *Metastelmate liesneriano* trichomatibus marginalibus albis loborum corollae longitudine trichomatibus medianis translucidis aequantes et lobis coronae basi adnatis corollae recedit.

Twining vines, woody and corky below, cork pale brown, latex white, roots fibrous; young stems puberulent in a broad band, sometimes with a thin line of trichomes on opposite side, trichomes white, recurved, 0.2–0.4 mm long, internodes 0.5–5 cm. Leaves opposite, without pseudostipules, blades mostly elliptic, sometimes somewhat ovate or obovate, 1.9–3.7 × 0.8–1.3 cm, apex acute to rounded or emarginate, apiculate, base obtuse to rounded or rarely subcordate, adaxially sparsely puberulent on midrib and margin, abaxially glabrous, lateral nerves 6 to 10 pairs, middle veins 30°–65° to midrib, colleters 0 to 4; petioles 2.2–4 mm, puberulent on adaxial margin. Inflorescence extra-axillary, 1 per node or sometimes with a subsidiary inflorescence on a short axillary shoot, congested-racemiform or more commonly congested-paniculiform, 5- to 14-flowered, peduncle 0–1.6 mm, puberulent in 1 line, axis to 1 mm, pedicel 1–2.2 mm, glabrous to sparsely puberulent, in 1 line or generally, bracts 0.25–0.5 × 0.2–0.3 mm, ovate; calyx with 0 to 2 colleters below each sinus within, lobes ovate with rounded tips, 0.9–1.2 × 0.6–0.9 mm, sparsely puberulent abaxially, especially at base, glabrous adaxially, green to purple with scarious margins; corolla campanulate, white or tinted pink outside, tube 0.8–1 mm long, glabrous, lobes lanceolate with acute tips, erect or tips somewhat reflexed, 2–2.3 × 0.8–1 mm, abaxially glabrous, adaxially with marginal trichomes erect, white, unicellular, 0.3–0.4 mm long, covering the distal third to three-quarters of the margin, and with center trichomes erect or retrorse, translucent, unicellular, 0.2–0.4 mm long, covering the distal half to the entire center of the lobes; gynostegium with stipe 0.2–0.4 × 0.6–0.7 mm, ovoid, corona lobe bases covering the length of the stipe, corona lobes acicular with broad, keeled bases adnate to the corolla tube up to nearly the same height as the attachment to the stipe, tips acute, erect or somewhat recurved, free part 0.8–1 × 0.15–0.2 mm, slightly exceeding style apex, terminal anther appendages ovate, 0.3–0.4 × 0.2–0.35 mm, erect or somewhat inclined over style apex, white, anthers quadrate to trapezoidal, 0.3–0.5 × 0.4–0.65 mm, guide rails straight, salient at base, 0.25–0.3 mm long; pollinaria pendent, corpusculum 0.15–0.19 × 0.08–0.1 mm, subsagittate, pale brown, translators 0.06–0.09 mm, thin, round in cross section, somewhat geniculate, pollinia 0.19–0.23 × 0.07–0.1 mm, narrowly obovoid, proximally thin and sterile; style apex 0.5–0.6 mm wide, shallowly conical. Follicle 1, fusiform-attenuate, 4.2–6 × 0.2–0.3 cm, glabrous, seeds ca. 18; seeds obovate, cucullate, ca. 3.8 × 1.8 mm, reddish brown, margin 0.1–0.2 mm, irregularly dentate on distal third, concave side tuberculate, convex side sparsely tuberculate near margin, coma 1.5–2 cm, tawny.

Liede and Meve (2004) described and provided an excellent illustration of this new species as *Metastelma barbigerum* var. *liesnerianum* (L. O. Williams) Liede & Meve. *Metastelma liesnerianum* (L. O. Williams) Liede, as I recognize the taxon, was originally based upon a single collection from Guanacaste, Costa Rica, and apparently Liede and Meve saw only a photograph of the type and no other Costa Rican material and based their description and illustration on material from Belize and southern Mexico. I have now studied seven additional collections of *Metastelma liesnerianum*, all from Guanacaste, and find that it is amply distinct from the plants from Belize and southern Mexico. Notwithstanding the highly unlikely disjunction, spanning the well-collected countries of Nicaragua, El Salvador, Honduras, and Guatemala, the characters distinguishing the two species, or for that matter almost any species of *Metastelma*, are not particularly visible on photographs. The most readily obvious difference between the two species is in the corolla lobe pubescence; *Metastelma liesnerianum* has the white, marginal trichomes of the corolla 0.05–0.1 mm long and the central, translucent trichomes 0.4–0.5 mm long, distinctly contrasting in length, while in *M. thalamosiphon* the marginal trichomes are 0.3–0.4 mm long and the medial trichomes are 0.2–0.4 mm long, the central trichomes always equal to or shorter than the marginal trichomes and more or less concealed by them. Somewhat less obvious, but even more compelling, the corona lobes of *Metastelma thalamosiphon* are broadly keeled at the base, with the keels adnate to the corolla tube; the broad bases of the corona lobes, adnate to about the same level on the stipe and the corolla tube partition the corolla tube into

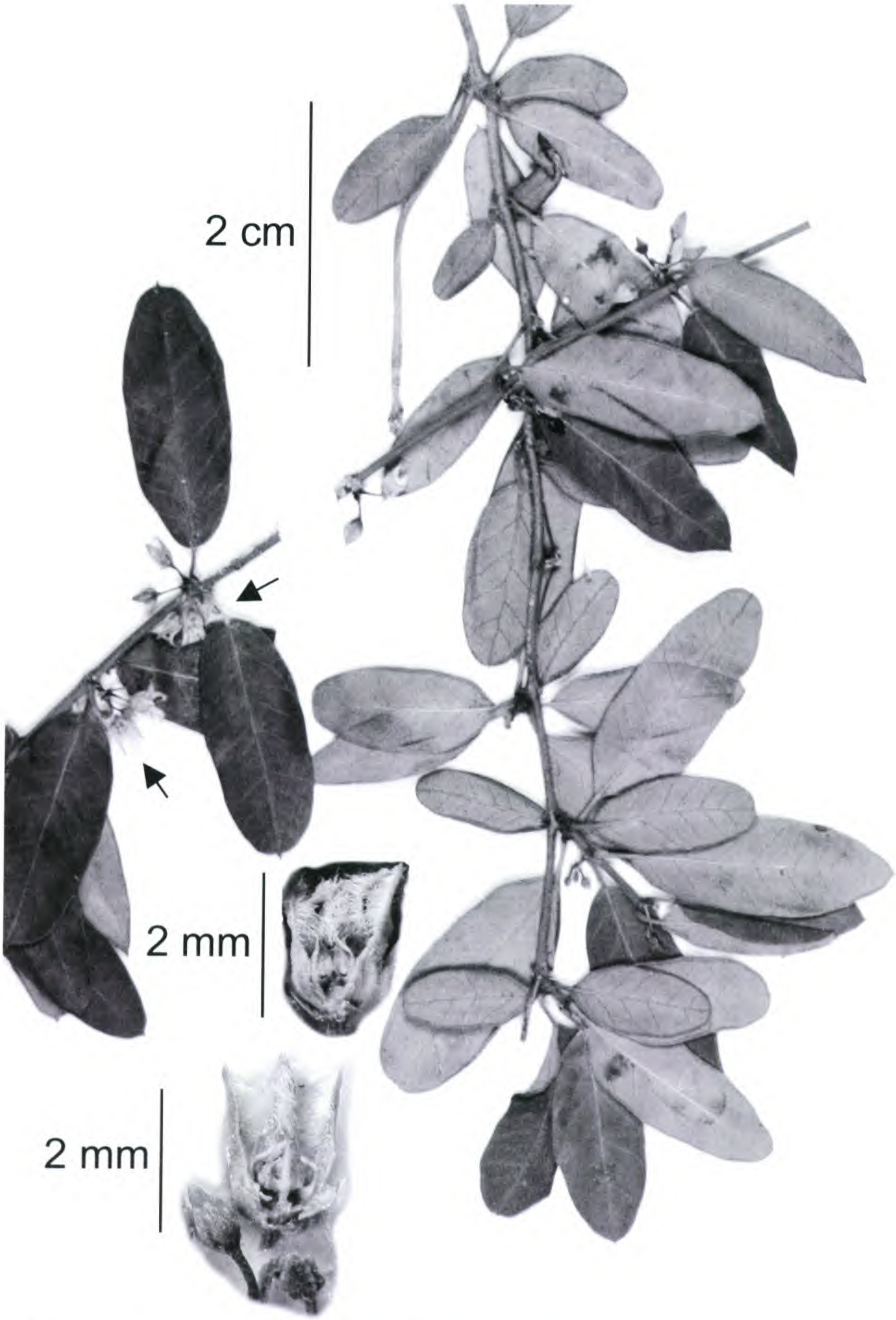

Figure 3. *Metastelma thalamosiphon* W. D. Stevens. Photograph of branches and opened flowers of *Cabrera & Cabrera 11860* (MO).

5 chambers (see Liede & Meve, 2004, p. 44, fig. 4-e'). In *Metastelma liesnerianum* the corona lobes are entirely free from the corolla and the corolla tube is not chambered.

Metastelma thalamosiphon grows in seasonally inundated savannas at 0 to 220 m elevation. It has been most commonly collected in Belize and adjacent Mexico. Twelve additional collections cited

by Liede and Meve (2004) under *Metastelma barbigerum* var. *liesnerianum*, not examined in this study, may be found to pertain to this species and provide the logical addition of Petén, Guatemala, to the range. The species seems to flower throughout the year.

Paratypes. MEXICO. **Campeche:** 6 km al E de Silvictuc sobre la carr. Francisco Escárcega–Chetumal, *E. Cabrera C. & H. de Cabrera 10964* (MO); 8 km al SE de Conhuas sobre el camino al Centro Ceremonial de Calakmul, *E. Cabrera C. & H. de Cabrera 11860* (MO); 10 km al SE de Sabancuy sobre el camino Escárcega–Ciudad del Carmen, *E. Cabrera C. & H. de Cabrera 11869* (MO); Km 29, al S de la entrada a Calakmul, *E. Madrid N., E. Lira, E. Martínez S., D. Alvarez M. & S. Ramírez A. 531* (MO); 9 km al SE de Dos Naciones, camino a El Civalito, *E. Martínez S., D. Alvarez M. & S. Ramírez A. 31430* (MO); Km 31 de Calakmul, *E. Martínez S., D. Alvarez M. & S. Ramírez A. 31681* (MO). **Chiapas:** W of Catazaja on road to Villahermosa, *D. Breedlove & G. Davidse 55307* (MO); Aguacate, *E. Matuda 3765* (F). **Tabasco:** 17 km al NE de Ciudad del Carmen sobre la carr. a Champotón, Isla del Carmen, *E. Cabrera C. & H. de Cabrera 15072* (F, MO). **Quintana Roo:** 20 km al NO de Felipe Carillo Puerto sobre el camino a Vigía Chico, *E. Cabrera C. & H. de Cabrera 4040* (MO). **Yucatan:** 3 km al O de Tabí sobre el camino Yaxcabá–Sotuta, *E. Cabrera C. & H. de Cabrera 10737* (MO). BELIZE. Salt Creek Estate, Mi. 18 Northern Hwy., *L. Dieckman 153a* (MO); Hattieville, *J. Dwyer 10402* (MO), *J. Dwyer & R. Pippen 10093* (MO); 12.5 mi. NW of Belize, Northern Hwy., *J. Dwyer 10706* (F, MO); Mi. 11, Northern Hwy., *J. Dwyer 10937* (MO), *A. Gentry 7640* (MO); Mi. 19, Northern Hwy., *J. Dwyer & R. Liesner 12011* (F, MO); Mi. 5 3/4 Northern Hwy., *J. Dwyer 12774* (MO, NY); Baumgartner's Ridge Lagoon Plantation, Mi. 11 1/2 Northern Hwy., *J. Dwyer 13074* (MO); Hector Creek, *P. Gentle 1508* (MO, NY); 12 mi. W of Belize, *S. McDaniel 13082* (MO); 1 mi. W of jct. w/ road to Ferguson Bank, 8 mi. E of Hattieville, along Hector Creek Road, *P. Sorensen 7081* (F, MO); 1–2 mi. S of Gales Point, *G. Proctor 36545* (MO); along New Northern Hwy. at jct. w/ road to Crooked Tree, *R. Worthington 24077* (MO).

3. Metastelma thysanotum W. D. Stevens, sp. nov. TYPE: El Salvador. Ahuachapán: San Benito, en el bautizadero, 850 m, 26 July 1995, *M. Sandoval & E. Sandoval 96* (holotype, MO; isotypes, B, EAP, LAGU). Figure 4.

Species haec *Metastelmati sepicola* indumento corollae similis, a *M. pedunculare* forma loborum coronae similis, ab utroque lobis coronae longioribus distincta.

Twining vines, woody and corky below, cork pale brown, latex white, underground parts unknown; young stems glabrous or internodes with a thin line of recurved white trichomes ca. 0.1 mm long, internodes 2–11 cm. Leaves opposite, without pseudostipules, blades lanceolate to elliptic, 2.1–6.2 × 0.6–1.6 cm, apex acute to attenuate, apiculate, base acute to rounded, adaxially glabrous or sparsely puberulent on midrib and margin, abaxially glabrous, lateral nerves 11 to 15 pairs, middle veins 40°–55° to midrib, colleters 0 to 2; petioles 3.5–10 mm, puberulent on adaxial margin. Inflorescence extra-axillary, 1 per node or sometimes with a subsidiary inflorescence on a short axillary shoot, congested-racemiform, 4- to 20-flowered, peduncle 5–16 mm, glabrous or puberulent in 1 line, axis to 3 mm, thickened, pedicel 1.5–3.5 mm, glabrous or puberulent in 1 line, bracts 0.35–0.6 × ca. 0.3 mm, deltate; calyx with 1 colleter below each sinus within, lobes ovate with rounded tips, 0.6–0.9 × 0.3–0.6 mm, sparsely puberulent abaxially, glabrous adaxially, green to purple with scarious margins; corolla campanulate, white to pale yellowish green, tube 0.7–1 mm long, somewhat saccate below lobes, glabrous, lobes ovate with acute tips, erect, 0.8–1.3 × 0.4–0.8 mm, with 2 submarginal fleshy ridges, abaxially glabrous, adaxially with a thin, submarginal line of erect, white, unicellular trichomes 0.05–0.1 mm long, center and immediate margins of lobes glabrous; gynostegium with stipe 0.5–0.6 × 0.3–0.5 mm, narrowly winged, corona lobes borne at top of stipe, ligulate with rounded tips, keeled at the base, appressed to anthers and arching over top of style, tips overlapping above style apex, free part 0.5–0.7 × 0.1–0.2 mm, terminal anther appendages nearly circular, 0.15–0.25 mm diam., appressed to margin of style apex, white, anthers rectangular, 0.18–0.25 × 0.35–0.55 mm, guide rails rounded, widest at center, 0.13–0.25 mm long; pollinaria pendent, corpusculum 0.07–0.13 × 0.04–0.05 mm, ellipsoid, pale brown, translators 0.05–0.08 mm, thin, round in cross section, strongly sigmoid, pollinia 0.12–0.15 × 0.05–0.08 mm, narrowly obovoid, proximally thin and sterile; style apex 0.5–0.7 mm wide, slightly umbonate in center. Follicle 1, fusiform-attenuate, ca. 4.7 × 0.5 cm, glabrous; seeds unknown.

This new species was treated as "*Metastelma* sp. B" in *Flora de Nicaragua* (Stevens et al., 2001). Liede and Meve (2004) placed *Metastelma sepicola* Pittier, endemic to Costa Rica, into the synonymy of *M. pedunculare* Decaisne, endemic to Guatemala, stating that the two "show no constant differing characters." They also studied one of the paratypes of *Metastelma thysanotum*, *Molina 23080*, and while noting some differences, decided that more material was needed to make a decision. As recognized here, *Metastelma sepicola* consistently differs from *M. pedunculare* in having the inner face of the corolla lobes with a thin line of submarginal, erect, white trichomes ("verrucose trichomes" of Liede & Meve, 2004, p. 34) while the center of the

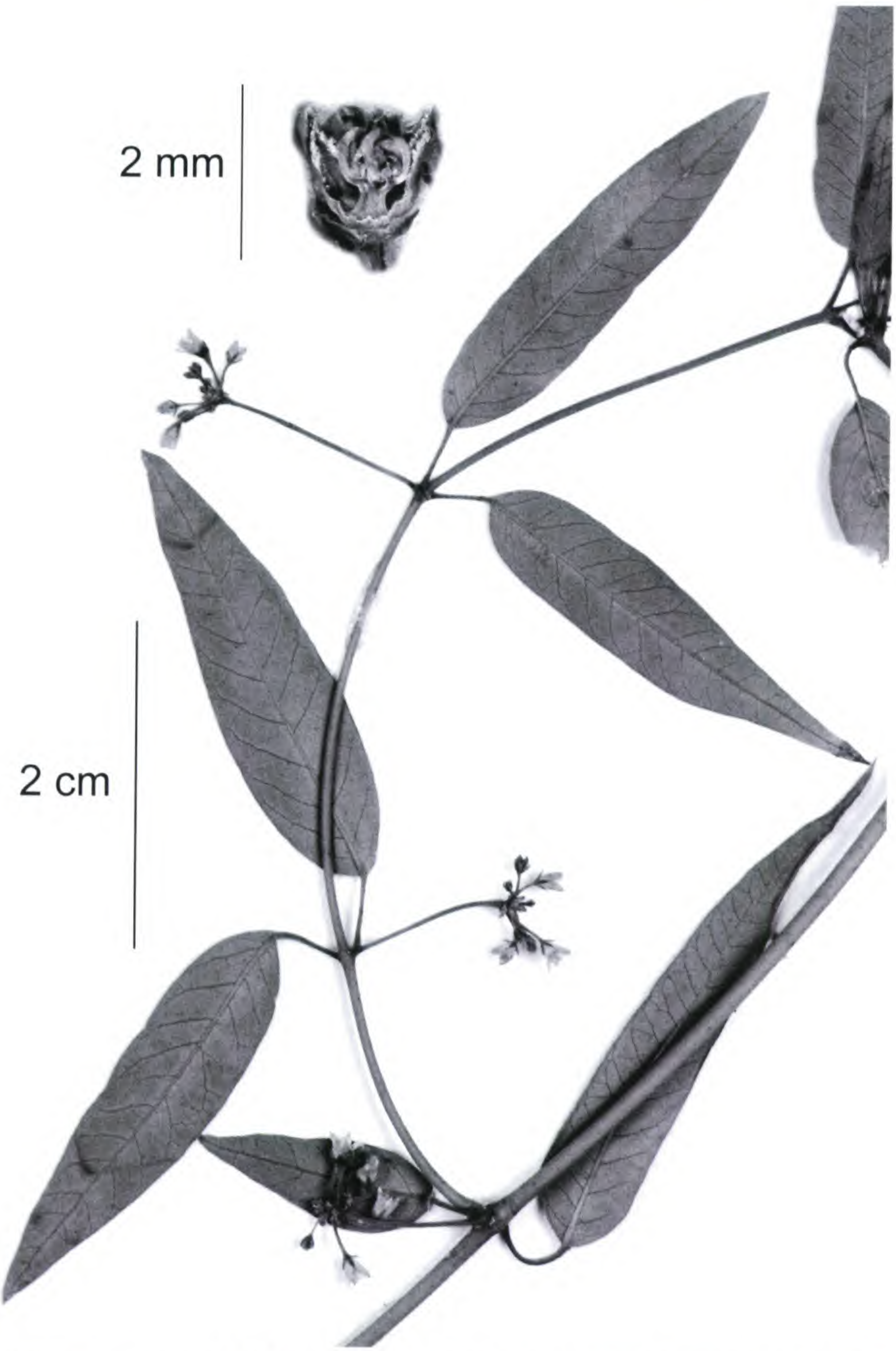

Figure 4. *Metastelma thysanotum* W. D. Stevens. Photograph of branch and opened flower of *Sandoval & Román 1365* (MO).

lobes are glabrous and *M. pedunculare* has no submarginal line of trichomes, but the center of the lobes are covered with retrorse, nearly translucent trichomes ("smooth, hispid, downwardly directed trichomes" of Liede & Meve, 2004, p. 34). Furthermore, the corona lobes of *Metastelma sepicola* are markedly spathulate, much broader at the tip, while those of *M. pedunculare* are ligulate or even slightly narrowed at the tip. *Metastelma thysanotum* has exactly the corolla indumentum of *M. sepicola*, but the corona lobes are ligulate, as in *M. pedunculare*. However, both *Metastelma sepicola* and *M.*

pedunculare have corona lobes that are shorter than to nearly equaling the level of the style apex, while in *M. thysanotum* the corona lobes are longer than, loosely appressed to, and more or less reaching the opposite side of the top of the style apex, crossing at the center. Somewhat less obviously, there are also consistent size differences: *Metastelma thysanotum* has corolla lobes 0.8–1.3 mm long and gynostegium stipes 0.5–0.6 mm long, *M. pedunculare* has corolla lobes 1.7–2.1 mm long and stipes 0.9–1.1 mm long, and *M. sepicola* has corolla lobes 1.5–1.8 mm long and stipes 0.7–1.1 mm long. All three of these species, as well as *Metastelma stenomeres* (Standley & Steyermark) W. D. Stevens, have inflorescences that tend to flower longer than most species of *Metastelma*, and can produce thickened axes covered with pedicel scars; *Molina 23080*, the one specimen of *Metastelma thysanotum* examined by Liede and Meve (2004), is not unusual in this regard, but does have numerous inflorescences aggregated on short, leafless shoots, and perhaps is diseased.

Metastelma thysanotum is found on volcanic soils from southwestern Guatemala through El Salvador to north-central Nicaragua, and will probably be discovered in southern Honduras. It has been found between 350 and 1600 m elevation and probably flowers year-round, although it has been most frequently collected with flowers between July and September.

Paratypes. GUATEMALA. **Chimaltenango:** Alameda, *J. Johnston 1022* (F). **Sacatepéquez:** 4 km NW of San Miguel Dueñas on road to Acatenango, *M. Nee, D. Atha & J. J. Castillo M. 47244* (MO, NY). **Sololá:** Santo Tomás, *J. Cuj 7977* (MO, UVAL). EL SALVADOR. **Ahuachapán:** along road between San Francisco Menéndez and Tacuba, *T. Croat 42148* (MO), *42170* (MO); San Francisco Menéndez, El Corozo, *J. Rosales 1195* (B, BM, LAGU, MO); San Benito, *E. Sandoval & F. Chinchilla 481* (B, LAGU, MO), *E. Sandoval & A. Román 1365* (B, LAGU, MO), *E. Sandoval 1689* (B, EAP, LAGU, MO); P.N. El Imposible, *A. Sermeño 1167* (LAGU, MO), *R. Toledo 23* (B, LAGU, MO), *R. Villacorta, R. Toledo & R. López 878* (B, LAGU, MO). **Santa Ana:** El Pinalito, *E. Montalvo, J. González & R. Villacorta 6328* (LAGU, MO). NICARAGUA. **Estelí:** Estanzuela Creek, 8 km W of Estelí, *A. Molina R. 23080* (F, MO, NY). **Matagalpa:** 3 km al SE de Esquipulas, *P. Moreno 25352* (MO).

4. Metastelma triodontum W. D. Stevens, sp. nov. TYPE: Guatemala. Huehuetenango: above La Libertad, Cerro Pueblo Viejo, 1900 m, 20 Aug. 1942, *J. Steyermark 50999* (holotype, MO; isotype, F). Figure 5.

Speciebus corona trilobata cum *Metastelmate longicoronato* congruens, sed differt floribus minoribus indumento corollae alis antherae curvatis.

Twining vines, woody and corky below, cork brown, latex unknown, underground parts unknown; young stems puberulent on 1 side with recurved white trichomes 0.15–0.2 mm long, internodes 1–3 cm. Leaves opposite, without pseudostipules, blades narrowly elliptic, 2–2.5 × 0.4–0.8 cm, apex acute, apiculate, base acute, adaxially glabrous except puberulent on midrib and margin, abaxially glabrous or with a few trichomes along midrib, lateral nerves 4 to 6 pairs, middle veins 50°–60° to midrib, colleters 0 to 2; petioles 1.5–2.5 mm, puberulent on adaxial margin. Inflorescence extra-axillary, 1 per node, congested-racemiform, 4- to 6-flowered, peduncle 1.5–3.5 mm, puberulent on 1 side, pedicel 1–2 mm, puberulent on 1 side, bracts 0.4–0.7 × 0.3–0.5 mm, ovate; calyx with 1 colleter below each sinus within, lobes ovate with rounded tips, 0.6–0.7 × 0.35–0.4 mm, puberulent at base and margin abaxially, adaxially glabrous, purple with scarious margins; corolla campanulate, white, tube 0.5–0.6 mm long, abaxially glabrous, adaxially with trichomes of lobes continuing into top of tube, lobes lanceolate with acute tips, patent, 1–1.1 × 0.5–0.6 mm, abaxially glabrous, adaxially with broad margins and distal half covered with erect, white, unicellular trichomes, 0.1–0.15 mm long, center trichomes restricted to a narrow strip in basal half, dense, retrorse, translucent, unicellular, 0.1–0.15 mm long; gynostegium with stipe 0.15–0.2 × 0.4–0.5 mm, broadly winged, corona lobes borne at top of stipe, 3-lobed, laminar, free part ca. 0.65 × 0.4 mm, central lobule narrowly deltate, bent sharply over style apex, lateral lobules small, borne near middle, deltate, terminal anther appendages ovate, ca. 0.2 × 0.2 mm, appressed to style apex, white, anthers rectangular in outline, ca. 0.3 × 0.4 mm, guide rails nearly vertical at top, curving outward toward base, ca. 0.3 mm long; pollinaria pendent, corpusculum ca. 0.14 × 0.05 mm, subsagittate, brown, translators ca. 0.04 mm, round, bent at middle, pollinia ca. 0.16 × 0.05 mm, asymmetrically ellipsoid; style apex ca. 0.5 mm wide, nearly flat with small umbo. Follicles and seeds unknown.

Among the Mesoamerican species of *Metastelma*, only this new species and *Metastelma longicoronatum* (L. O. Williams) Liede have 3-lobulate corona lobes. The flowers of *Metastelma longicoronatum* are larger overall (2.4–2.9 mm vs. 1.5–1.7 mm long) and most notably the corona lobes are longer (1.4–1.9 mm vs. 0.65 mm), have their lateral lobules at the base rather than the middle and curving upward rather than straight, and have their central lobules erect and only slightly arching over the

Figure 5. *Metastelma triodontum* W. D. Stevens. Photograph of branch and opened flower of *Steyermark 50999* (isotype, F).

style apex rather than bent sharply over the style apex. *Metastelma longicoronatum* also has longer inflorescences, leaves with more secondary veins, and guide rails that are straight and at about 45° to the gynostegium axis rather than nearly vertical at the top and gradually flaring outward. A few other species have flowers in the size range of *Metastelma triodontum*, but all have entire corona lobes and other differences. The indumentum of the corolla lobes, with the white, marginal trichomes cov-

ering most of the lobes and the translucent, central trichomes restricted to a narrow line in the basal half, seems especially distinct.

Metastelma triodontum is known only from the type collection from Guatemala.

5. Metastelma yucatanense W. D. Stevens, sp. nov. TYPE: Mexico. Quintana Roo: directly W of Puerto Morelos, 5 m, 4 May 1982, *G. Davidse, M. Sousa S., A. Chater & E. Cabrera C. 20050* (holotype, MO; isotype, MEXU). Figure 6.

Species haec a *Metastelmate palmeri* differt stipite breviore et a corona occulta alis antherae rectis et basi non curvatis.

Twining vines, herbaceous, without cork, latex white, underground parts unknown; young stems glabrous or internodes with a thin line of recurved white trichomes 0.1–0.3 mm long, internodes 2–5 cm. Leaves opposite, without pseudostipules, blades elliptic to ovate, 1.1–2.8 × 0.4–0.9 cm, apex acuminate to rounded, apiculate, base obtuse to rounded, adaxially glabrous except inconspicuously puberulent on midrib and margin, abaxially glabrous, lateral nerves 5 to 8 pairs, more or less inconspicuous, middle veins 30°–55° to midrib, colleters 0 to 2; petioles 1.5–5 mm, puberulent on adaxial margin. Inflorescence extra-axillary, 1 per node or sometimes with a subsidiary inflorescence on a short axillary shoot, congested-racemiform, 7- to 16-flowered, peduncle 1–4.5 mm, glabrous or puberulent in 1 line, axis to 2.5 mm, pedicel 2.5–4.5 mm, bracts 0.2–0.7 × 0.2–0.4 mm, ovate; calyx with 0 to 3 colleters below each sinus within, lobes ovate with rounded tips, 0.6–1.1 × 0.4–0.7 mm, sparsely puberulent at base abaxially and sometimes on margin, adaxially glabrous, green to purple with scarious margins; corolla shallowly campanulate, white to cream, tube 0.4–0.6 mm long, glabrous or with adaxial marginal trichomes of lobes extending into top of tube, lobes lanceolate with rounded tips, spreading, 1.4–2.3 × 0.6–0.9 mm, with 2 submarginal fleshy ridges, abaxially glabrous, adaxially with margins covered with erect, white, unicellular trichomes, 0.1–0.3 mm long distally, becoming 0.05–0.1 mm long proximally, center trichomes absent or, when present, retrorse, yellowish translucent, unicellular, 0.1–0.2 mm long; gynostegium with bulbous stipe 0.2–0.4 × 0.5–0.7 mm, broadly winged with bases of corona lobes that cover the entire stipe, corona lobes lanceolate with attenuate tips, keeled at the base, erect or somewhat sigmoid, free part 0.5–1.1 × 0.2–0.3 mm, terminal anther appendages nearly circular, 0.25–0.35 mm diam., appressed to margin of style apex, white, anthers trapezoidal, 0.4–0.5 × 0.45–0.55 mm, guide rails straight, ± tangential to anther body, radially salient at top and somewhat inclined toward the axis below, 0.35–0.55 mm long; pollinaria pendent, corpusculum 0.09–0.17 × 0.06–0.11 mm, ovoid to ellipsoid, brown, translators 0.05–0.09 mm, thin but dilated distally, round in cross section, sigmoid to geniculate, pollinia 0.18–0.23 × 0.06–0.1 mm, ellipsoid or somewhat ovoid or obovoid; style apex 0.55–0.7 mm wide, convex. Follicle 1, fusiform-attenuate, 4.4–4.8 × 0.15–0.2 cm, glabrous, seeds ca. 14; seeds obovate, nearly elliptical, flat or cucullate, 3.8–4 × 1.4–1.6 mm, reddish brown, margin 0.1–0.2 mm, inconspicuous, finely and inconspicuously undulate, concave side tuberculate, convex side verrucate near margin, coma 2–3 cm, tawny.

Metastelma yucatanense shares the general shape of the corona with *M. palmeri* S. Watson, but that species, which in my concept ranges from Texas to Puebla and perhaps Oaxaca, at 400–2300 m elevation, differs in a number of characters. The corolla lobes of *Metastelma palmeri* are generally covered with uniformly short white trichomes (0.02–0.1 mm) and the translucent trichomes are restricted to a basal triangle, while the white trichomes of *M. yucatanense* form a discrete marginal band and are longer at the tips of the lobes (0.1–0.3 mm) and become gradually shorter toward the base of the lobes; *M. palmeri* has a distinct stipe with the corona lobes attached at the top, while this new species has a somewhat shorter, and bulbous, stipe that is completely covered by the broadly keeled bases of the corona lobes; *M. palmeri* has the guide rails more vertically and more radially oriented with a prominent radial projection at the base, while the new species has guide rails that are somewhat inclined under the anther body, more tangentially oriented, and are straight, with no basal projection. *Metastelma turneri* Liede & Meve shares the pattern of corolla indumentum with this new species, but is restricted to northeastern Mexico, is more robust and pubescent, and has shorter guide rails (0.2–0.25 mm) that tilt away from the anther body, among other differences. The follicles of this new species are distinctively thin and the seeds are small for the genus. The single Guatemalan collection (*Contreras 9336*) is the only one cited by Liede and Meve (2004), and they tentatively assign it to *Metastelma palmeri*. While it clearly is not *Metastelma palmeri*, this specimen represents the low extremes of most measurements

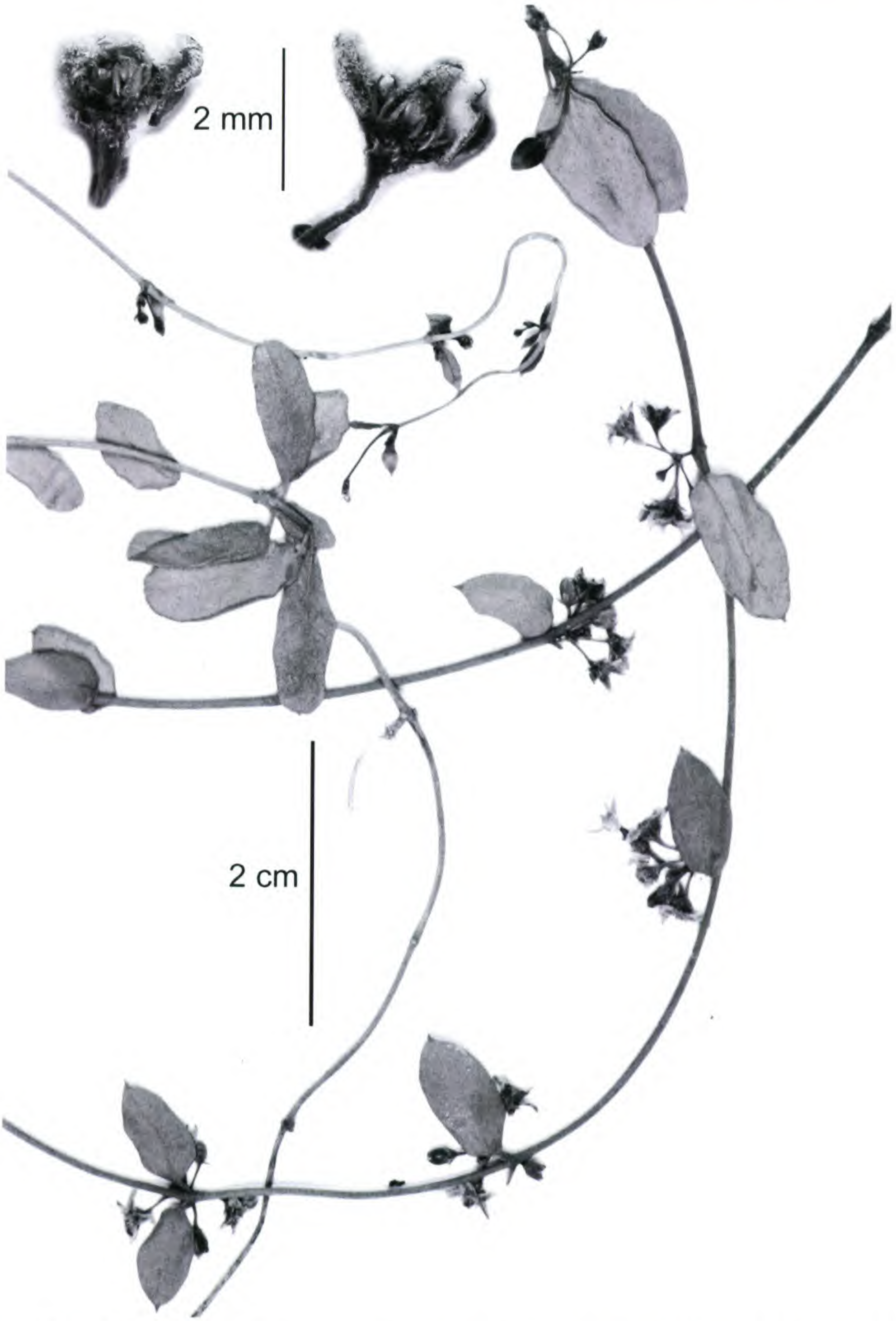

Figure 6. *Metastelma yucatanense* W. D. Stevens. Photograph of branches and opened flowers of *Cabrera & Cabrera 6487* (MO).

of *M. yucatanense* and is somewhat disjunct from the other collections.

Metastelma yucatanense is primarily a coastal species but has been found somewhat inland, up to about 65 m elevation, and apparently flowers year-round.

Paratypes. MEXICO. **Quintana Roo:** 10 km al N de Puerto Morelos, camino a Punta Caracol, *E. Cabrera C. &*

H. de Cabrera 3139 (MO); 15 km al N de Punta Sam, *E. Cabrera C. & H. de Cabrera 6487* (MO); camino a Nizuc, *P. Moreno 101* (MEXU); Punta Sam, 5 km al N de Puerto Juárez, *H. Quero, H. Flores & R. Grether 2884* (ENCB, MO), *O. Téllez V. & E. Cabrera C. 1545* (MO); Isla Holbox, *V. Rico-Gray & I. Espejel 181* (F); Puerto Morelos, *P. Moreno 312* (MEXU), *M. Sousa S., O. Téllez V. & E. Cabrera C. 10793* (MO). **Yucatán:** 10 km al N de Telchak Pueblo, carr. Motul–Telchak Puerto, *E. Cabrera C. & H. de Cabrera 9674* (MO); above Calcehtok, *S. Darwin 2317* (MO); 8.5 km al N de Dzemul camino a Xtampu, *R. Durán & M. Méndez 2869* (MO). GUATEMALA. **Izabal:** Cadenas (Puerto Méndez), Sarstun River, *E. Contreras 9336* (MO).

Orthosia Decaisne in A. DC., Prodr. 8: 526. 1844. TYPE: *Orthosia congesta* (Vellozo) Decaisne (lectotype, designated by A. A. Bullock, Kew Bull. 13: 98. 1958).

Liede (1997) first pointed out that some North American species of *Cynanchum*, sensu Woodson, belonged to the genus *Orthosia*, previously only known from southern South America. In her analysis of *Orthosia* and the related genera, the inflorescences were described as axillary or extra-axillary, simple and sciadioidal. While the inflorescence description is basically correct in a descriptive sense, it is instructive to understand their development. Typical inflorescences of Asclepiadoideae are either terminal or extra-axillary, apparently developmentally terminal, but pushed aside by the emerging shoot, and one per node. Many species of *Orthosia* have these apparently axillary inflorescences, two per node, that are congested-racemiform or congested-paniculiform. Other species, clearly related in other regards, have both axillary and extra-axillary inflorescences or even exclusively extra-axillary inflorescences. *Orthosia glaberrima*, validated below, is especially informative in understanding the origin of this inflorescence type, having axillary, extra-axillary, and even terminal inflorescences, sometimes more than one kind at a node, and most unusual, the apparently axillary inflorescences often revert to being vegetative shoots, leaving a cluster of pedicel scars at the base of lateral shoots. Clearly, the axillary inflorescences of *Orthosia*, as is the case with the related *Tassadia* (Stevens, 2002), are actually condensed axillary branches with one, then racemiform, or more, then paniculiform, terminal or extra-axillary true inflorescences. Only Mesoamerican species of *Orthosia* are considered here; five species are described as new and three new combinations are provided.

1. **Orthosia cynanchoides** W. D. Stevens, sp. nov. TYPE: Mexico. Chiapas: Rodeo, near Siltepec, 2800 m, 1 Aug. 1941, *E. Matuda 4562* (holotype, MO; isotypes, F, MEXU). Figure 7.

Inter species *Orthosiae* inflorescentiis solitariis et axillaribus et extra-axillaribus tubo corollae brevi tubo coronae brevi lobis coronae brevibus arcuatis gynostegio cylindrico brevistipitato poliniis ellipsoideis dimidio minor quam corpusculis differt.

Twining vines, woody and corky below, latex and underground parts unknown; young stems puberulent in a broad band, trichomes erect, 0.2–0.25 mm long, white, internodes 2–13 cm. Leaves opposite, persistent, without pseudostipules, blades lanceolate, 2.1–3.2 × 0.4–0.6 cm, apex acute to attenuate, apiculate or not, base obtuse to rounded, adaxially puberulent on midrib and margin, sparsely puberulent on basal half of surface, abaxially glabrous or with a few trichomes along midrib, lateral nerves 3 to 4 pairs, inconspicuous, middle veins 55°–60° to midrib, colleters 2; petiole 2–3 mm, densely puberulent along adaxial margin. Inflorescence axillary or extra-axillary, 1 per node, congested-racemiform, nearly umbelliform, 2 to 4 flowers open at a time, peduncle 0–2.5 mm, puberulent on 1 side, pedicel 3–3.5 mm, puberulent except 1 line glabrous, bracts lanceolate, 0.5–0.7 × 0.1–0.2 mm, purple; calyx without colleters, lobes elliptic with rounded tips, 0.7–0.8 × 0.5–0.6 mm, appressed-puberulent outside, glabrous inside, erect to ascending, purple; corolla shallowly campanulate, nearly rotate, glabrous, white, tube 0.5–0.6 mm long, lobes elliptic with rounded tips, 4–4.2 × 2–2.2 mm, spreading; gynostegium cylindrical, with stipe ca. 0.3 mm, corona of 5 lobes connate at base, borne at base of the stipe, tube ca. 0.1 mm long, lobes lanceolate, somewhat shouldered toward the rounded tip, ca. 0.8 × 0.45 mm, center of lobe adnate to stipe, then arching outward toward corolla tube and then back toward gynostegium, with the tips touching the center of the anther backs, terminal anther appendages ovate, ca. 0.3 × 0.3 mm, arching over and nearly covering style apex; anthers rectangular, ca. 0.7 × 0.5 mm, guide rails vertical, slightly bowed outward at center, ca. 0.7 mm long; pollinaria pendent, corpusculum ellipsoid, ca. 0.21 × 0.09 mm, brown, translators ca. 0.06 mm, thin, round in cross section, strongly sigmoid, pollinia ellipsoid, ca. 0.13 × 0.08 mm; style apex flat, ca. 0.6 mm wide. Immature follicles 2, divergent 180°, fusiform-attenuate, to 41 × 2 mm, smooth, sparsely puberulent, mature follicles and seeds unknown.

The single collection of this species, from near Siltepec and probably from cloud forest, was distributed as *Metastelma angustifolium* Turczaninow, a species of *Orthosia* from north and central Mexico that also passes under the name *Cynanchum kun-*

Figure 7. *Orthosia cynanchoides* W. D. Stevens. Photograph of branches and opened flower of *Matuda 4562* (isotype, F).

thii (Decaisne) Standley. *Orthosia cynanchoides* is superficially similar to this species, but the latter differs in many details, including having a conical gynostegium and corona lobes larger than, and completely covering, the anthers. Among the species of *Orthosia* with both apparently axillary and extra-axillary inflorescences, *O. cynanchoides* stands out in having both the corolla and the corona

divided nearly to the base and the corona lobes relatively short and strongly curved.

2. Orthosia extra-axillaris W. D. Stevens, sp. nov. TYPE: Costa Rica. San José: Cordillera de Talamanca, W ridge of Cerros Cuericí, 3160 m, 9°34′N, 83°40′W, 15 Sep. 1983, *G. Davidse 24730* (holotype, MO; isotype, CR). Figure 8.

Inter species *Orthosiae* inflorescentiis solitariis extra-axillaribus tubo coronae longo campanulato lobis coronae latis gynostegio cylindrico brevistipitato poliniis asymmetricis corpusculum fere aequantibus differt.

Twining herbaceous vines, latex white, underground parts unknown; young stems puberulent in a narrow to broad band, trichomes erect to somewhat reflexed, 0.2–0.4 mm long, white, internodes 1–13 cm. Leaves opposite, persistent, without pseudostipules, blades lanceolate, 2.5–4 × 0.5–1 cm, apex attenuate, apiculate or not, base acute, adaxially puberulent on midrib and margin, abaxially glabrous or puberulent on midrib, lateral nerves 4 to 6 pairs, middle veins 40°–50° to midrib, colleters 2; petiole 2–6 mm, puberulent along adaxial margin. Inflorescence extra-axillary, 1 per node, congested-racemiform or congested-paniculiform, 2 to 9 flowers open at a time, peduncle 0–4 mm, puberulent on 1 side, pedicel 2.5–5.5 mm, puberulent in 1 line, bracts lanceolate, 0.7–1.2 × 0.4–0.6 mm, green or purple; calyx with 0 to 2 colleters below each sinus within, lobes ovate with acute to rounded tips, 1.1–1.8 × 0.7–0.8 mm, with a few trichomes at base and margin outside, glabrous inside, ascending, green or purple; corolla shallowly campanulate, nearly rotate, glabrous, white or outside tinted with yellow, green, pink, or purple, tube 0.8–1 mm long, lobes ovate with rounded tips, 1.9–2.5 × 1.2–1.7 mm, ascending; gynostegium cylindrical, with stipe 0.1–0.3 mm, corona of 5 lobes connate at base, borne at the base of the stipe, tube 0.3–0.5 mm long, campanulate, lobes lanceolate, somewhat to strongly shouldered toward the rounded tip, 1–1.8 × 0.8–1.2 mm, erect, somewhat shorter to somewhat longer than the gynostegium, terminal anther appendages ovate, 0.35–0.5 × 0.25–0.5 mm, arching over and nearly covering style apex; anthers rectangular, 0.65–0.8 × 0.5–0.7 mm, guide rails vertical, straight, 0.65–0.8 mm long; pollinaria pendent, corpusculum ellipsoid to subsagittate, 0.19–0.25 × 0.08–0.13 mm, red-brown, translators 0.03–0.06 mm, thin, dilated at tip or not, round in cross section, straight to geniculate, pollinia ellipsoid, reniform or angularly obovoid, 0.14–0.18 × 0.09–0.11 mm; style apex convex, 0.6–1 mm wide. Immature follicles 2, divergent 180°, fusiform-attenuate, to 38 × 3 mm, smooth, sparsely puberulent at base, mature follicles and seeds unknown.

This species shares the general appearance of *Orthosia cynanchoides*, especially in the narrow, relatively coriaceous, persistent leaves and relatively large, nearly rotate corollas. However, *Orthosia extra-axillaris*, compared to *O. cynanchoides*, has corolla lobes about twice as long as the tube, rather than about eight times longer, and a corona with a longer, campanulate tube free from the stipe and larger lobes. The shapes of the corona lobes and of the pollinia are unusually variable but many other characters hold this small group of specimens together. The inflorescences are always of the typical extra-axillary sort and one per node, apparently the only *Orthosia* from North America without at least some axillary inflorescences. This Costa Rican endemic has been found in cloud forests between 2300 and 3160 m elevation and has been collected with flowers between June and October.

Paratypes. COSTA RICA. **Cartago:** 14 km SE of El Empalme, *F. Almeda, R. Wilbur & T. Daniel 3101* (MO); **Heredia:** P.N. Braulio Carillo, Sendero Cerro Guararí, *G. Rivera 107* (MO); P.N. Braulio Carillo, Estación Barva, *G. Varela 103* (MO). **San José:** Estación Cuericí, sendero a La Piedra, 5 km E de Villa Mills, *B. Gamboa R. 758* (MO).

3. Orthosia glaberrima (Woodson) W. D. Stevens, comb. nov. Basionym: *Metastelma glaberrimum* Woodson, in Woodson & Seibert, Ann. Missouri Bot. Gard. 24: 200. 1937. TYPE: Panamá. Chiriquí: valley of Río Chiriquí Viejo, near Monte Lirio, 5500 ft., 11 July 1935, *R. Seibert 300* (holotype, MO).

This species was treated as *Cynanchum sepium* (Decaisne) Standley in the *Flora of Guatemala* (Standley & Williams, 1969) and *Cynanchum glaberrimum* (Woodson) L. O. Williams in the *Flora of Panama* (Spellman, 1975). The species of *Orthosia* sometimes known as *Cynanchum sepium* is actually rare and endemic to a small area in the mountains east of Oaxaca, Mexico, in the district of Ixtlán, while *O. glaberrima* is common in the mountains from Chiapas to the Panama-Costa Rica border. *Metastelma pallidum* Rusby from Colombia is obviously related, and would provide an older epithet, but has a dense, yellowish indumentum not seen in the Mesoamerican collections, and is not considered synonymous.

Figure 8. *Orthosia extra-axillaris* W. D. Stevens. Photograph of branches and opened flowers of *Almeda et al. 3101* (MO).

4. Orthosia misera (L. O. Williams) W. D. Stevens, comb. nov. Basionym: *Cynanchum miserum* L. O. Williams, Fieldiana, Bot. 32: 38. 1968. TYPE: Guatemala. Alta Verapaz: Pansamalá, 3800 ft., July 1887, *H. Von Tuerckheim 1290* (holotype, US; isotypes, F, GH).

This species was treated as *Cynanchum miserum*

in the *Flora of Guatemala* (Standley & Williams, 1969). It is most similar to *Orthosia ramosa*, described and compared below. *Orthosia misera* is among the species of *Orthosia* completely leafless at maturity. It is found in cloud forests from Chiapas to Honduras.

5. Orthosia ramosa W. D. Stevens, sp. nov. TYPE: Honduras. Ocotepeque: vic. of El Portillo, Cordillera de Merendón, 2000 m, 31 Aug. 1975, *A. Molina R. & A. Molina 30910* (holotype, MO; isotypes, EAP, F). Figure 9.

Inter species *Orthosiae* inflorescentiis solitariis vel geminatis axillaribus tubo corollae longo tubo coronae brevi lobis coronae brevibus arcuatis gynostegio brevistipitato dorsis antherarum vesiculatis poliniis anguste obovoideis longis differt.

Twining or scandent vines, woody and corky below, latex white, underground parts unknown; young stems puberulent in an inconspicuous line, trichomes erect to reflexed, ca. 0.1 mm long, white, internodes 2–11 cm. Leaves opposite, caducous, without pseudostipules, when present on young shoots, blades linear to narrowly lanceolate, 1.1–3 × 0.1–0.3 cm, apex acute to attenuate, base obtuse to rounded, adaxially inconspicuously puberulent on midrib and margin, abaxially glabrous, lateral nerves ca. 15 pairs, inconspicuous, middle veins ca. 60° to midrib, colleters 2; petiole 1–3 mm, puberulent along adaxial margin. Inflorescence axillary, 1 or 2 per node, congested-racemiform, 2 to 4 flowers open at a time, peduncle 0–2 mm, puberulent on 1 side, pedicel 2–3.5 mm, glabrous or with a few scattered trichomes, bracts ovate, ca. 0.2 × 0.2 mm, green; calyx with 0 to 1 colleters below each sinus within, lobes ovate with rounded tips, 0.6–0.7 × 0.5–0.55 mm, with a few trichomes at base outside, glabrous inside, erect to ascending, green; corolla campanulate, nearly tubular, glabrous, white, tube 1.2–1.6 mm long, lobes ovate with rounded tips, 0.5–0.6 × 0.5–0.6 mm, erect; gynostegium with anther backs inflated, broadest in the center and tapering toward tip and base, with stipe 0.45–0.5 mm, narrowed in middle and 5-ribbed, corona of 5 lobes connate at base, borne at the base of the stipe, tube ca. 0.05 mm long, lobes deltate with rounded tips, 0.25–0.3 × 0.15–0.3 mm, arching outward toward corolla tube and then back toward gynostegium, with the tips touching the center of the stipe, terminal anther appendages ovate, 0.1–0.2 × 0.1–0.2 mm, arching over style apex; anthers rectangular in outline, 0.25 × 0.4–0.45 mm, guide rails somewhat tilted in at the top, straight, ca. 0.25 mm long; pollinaria pendent, corpusculum subsagittate, 0.10–0.11 × 0.05–0.06 mm, pale brown, translators 0.06–0.09 mm, thin, round in cross section, geniculate, pollinia narrowly obovoid, 0.13–0.14 × 0.05–0.06 mm; style flat or slightly convex, 0.4–0.5 mm wide. Follicles and seeds unknown.

This new species corresponds in superficial appearance to *Orthosia misera*, and both share pollinaria with long, geniculate translators and narrowly obovoid pollinia that are longer than the corpuscula. However, *Orthosia misera* has a more open campanulate corolla, a shorter stipe (ca. 0.3 mm), and straight, erect corona lobes that are as large as, and completely cover, the anthers. *Orthosia ramosa* is found in pine-oak and cloud forests in Honduras, between 1600 and 2200 m elevation, and is known to flower in May and August.

Paratypes. HONDURAS. **Cortés:** trail from Cerro Cantiles to Cerro Jilinco, *T. Hawkins 671* (EAP, MO). **Lempira:** Montaña de Celaque, SE part of massif, trail from Gracias to top of mtn, *G. Davidse & R. Zúniga 34697* (EAP, MO).

6. Orthosia rubens (L. O. Williams) W. D. Stevens, comb. nov. Basionym: *Cynanchum rubens* L. O. Williams, Fieldiana, Bot. 32: 39. 1968. TYPE: Guatemala. Chimaltenango: Santa Elena, 2400–2700 m, 27 July 1933, *A. Skutch 503* (holotype, US; isotype [fragment of holotype], F).

This species was treated as *Cynanchum rubens* in the *Flora of Guatemala* (Standley & Williams, 1969) and is endemic to Guatemalan cloud forests. It is the only Mesoamerican *Orthosia* with more than a hint of red on the corolla.

7. Orthosia smaragdina W. D. Stevens, sp. nov. TYPE: Guatemala. San Marcos: Finca Armenia, San Rafael Pie de la Cuesta to Carrizal, past Finca Africa, 1300–1600 m, 9 to 12 Aug. 1980, *J. Dwyer 15327* (holotype, MO). Figure 10.

Inter species *Orthosiae* inflorescentiis solitariis vel geminatis axillaribus tubo corollae longo tubo coronae longo partim obtengenti gynostegium lobis coronae longis gynostegio cylindrico poliniis ellipsoideis minor quam corpusculis differt.

Twining vines, woody and corky below, latex and underground parts unknown; young stems glabrous or with a few trichomes at the nodes, trichomes erect, ca. 0.1 mm long, white, internodes 2–5 cm. Leaves opposite, persistent, without pseudostipules, blades lanceolate, 4–6 × 1.2–1.7 cm, apex acute, apiculate, base obtuse to rounded, adaxially puberulent on midrib and

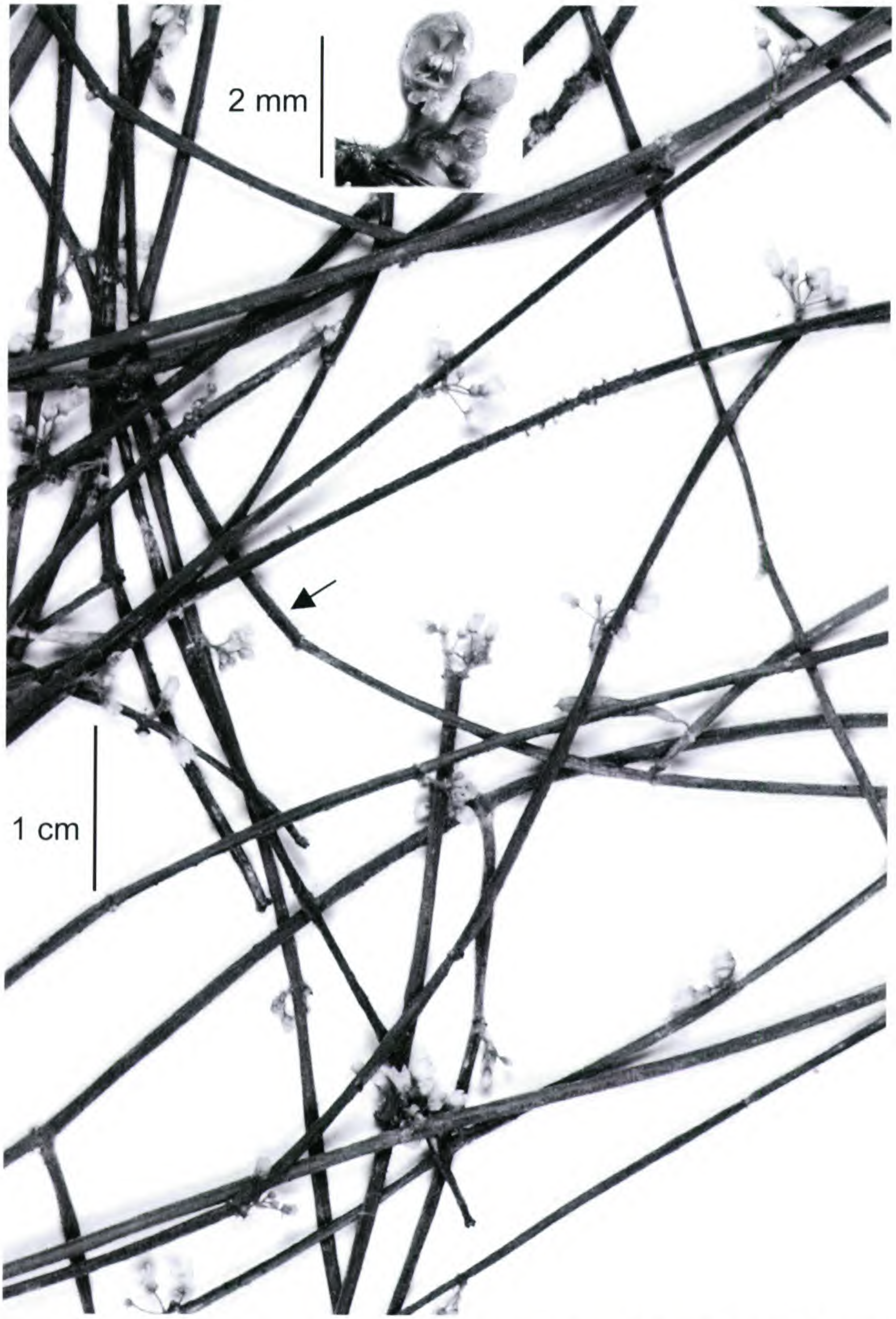

Figure 9. *Orthosia ramosa* W. D. Stevens. Photograph of branches and opened flowers of *Molina & Molina 30910* (isotype, F).

margin, abaxially puberulent on base of midrib, lateral nerves 7 to 9 pairs, middle veins ca. 55° to midrib, colleters 2; petiole 5–6 mm, sparsely puberulent along adaxial margin. Inflorescence axillary, 1 or 2 per node, congested-racemiform, sessile, 3 flowers open at a time, pedicel 3.5–4.2 mm, sparsely puberulent, bracts ovate, 0.3–0.5 × 0.2–0.3 mm, green; calyx without colleters,

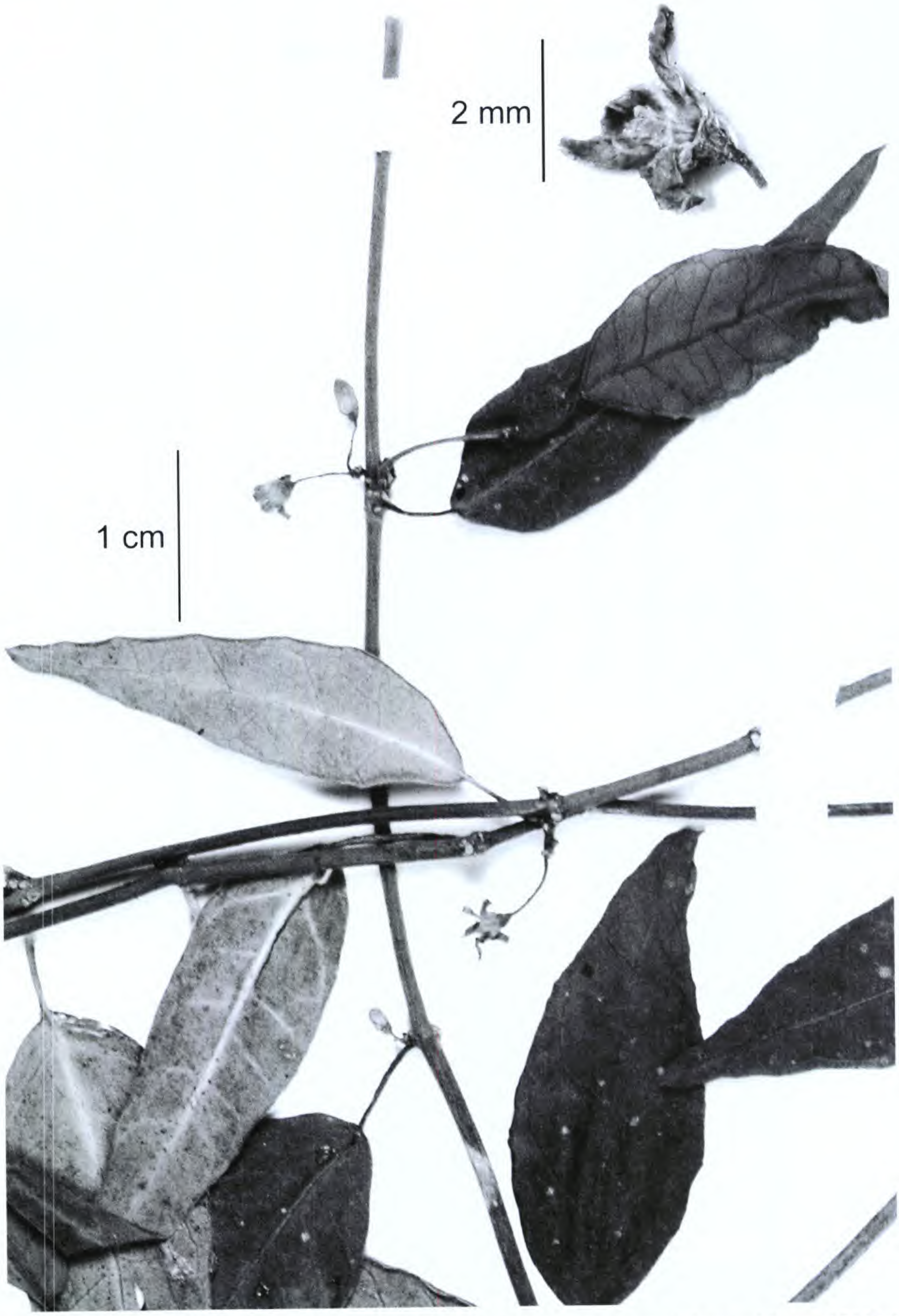

Figure 10. *Orthosia smaragdina* W. D. Stevens. Photograph of branches and opened flower of *Dwyer 15327* (holotype, MO).

lobes ovate with rounded tips, ca. 0.7 × 0.7 mm, appressed-puberulent outside, glabrous inside, erect, green; corolla campanulate, 5-fluted, glabrous, green, tube ca. 1.4 mm long, lobes elliptic with rounded tips, ca. 2 × 0.8 mm, erect; gynostegium cylindrical, sessile, corona of 5 lobes connate at base, borne at the base of the gynostegium, tube ca. 0.5 mm long, clasping around the lower third of the gynostegium, lobes narrowly deltate with acute or slightly bifid tips, ca. 1.5 × 0.7 mm, erect, exceeding the gynostegium, terminal anther appendages semicircular, ca. 0.3 ×

Figure 11. *Orthosia stipitata* W. D. Stevens. Photograph of branches and opened flower of *Hampshire et al. 466* (holotype, MO).

0.3 mm, arching over style apex; anthers rectangular or slightly trapezoidal in outline, ca. 1.2 × 0.55 mm, guide rails vertical, bowed inward, narrowest a little above the middle and slightly flared at base, ca. 1.1 mm long; pollinaria pendent, corpusculum ellipsoid, ca. 0.16 × 0.11 mm, pale brown, translators ca. 0.05 mm, thin, round in cross section, straight, pollinia ellipsoid, ca. 0.11 × 0.09 mm; style flat, ca. 0.6 mm wide. Follicles and seeds unknown.

This distinctive species, known only from the type, has relatively large leaves and flowers, described by the collector as emerald-green. This is the only Mesoamerican species of *Orthosia* with a tubular corona tightly clasping around the lower part of the cylindrical gynostegium; pollinators must probe the narrow gap between the gynostegium and the corona tube to access the opening at the base of the guide rails. The translators are short and straight and the pollinia are symmetrical and smaller than the corpuscula.

8. Orthosia stipitata W. D. Stevens, sp. nov. TYPE: Mexico. Chiapas: El Triunfo Reserve, 2100 m, 15°39′N, 92°50′W, 19 Feb. 1990, *R. J. Hampshire, P. J. Stafford, A. Reyes G., M. Heath & A. Long 466* (holotype, MO; isotypes, BM, MEXU). Figure 11.

Inter species *Orthosiae* inflorescentiis solitariis vel geminatis axillaribus tubo corollae longo tubo coronae brevi lobis coronae brevibus arcuatis gynostegio conico longistipitato dorsis antherarum vesiculatis poliniis anguste ellipsoideis longis differt.

Twining or scandent vines, latex and basal parts unknown; young stems puberulent in a fine line, trichomes erect, ca. 0.1 mm long, white, internodes 3–5 cm. Leaves opposite, caducous, without pseudostipules. Inflorescence axillary, 1 or 2 per node, congested-racemiform, sessile, 1 to 2 flowers open at a time, pedicel 3.5–4 mm, puberulent, mostly in 1 line, bracts deltate, 0.3–0.5 × 0.3 mm, green; calyx with 1 to 3 colleters below each sinus within, lobes ovate with rounded tips, 0.8–0.9 × 0.7–0.8 mm, appressed-puberulent outside, especially on midrib, glabrous inside, ascending, green; corolla campanulate, glabrous, white, tube ca. 1.5 mm long, lobes ovate with rounded tips, 1.6–1.7 × 1–1.1 mm, erect; gynostegium conical, anther backs inflated, stipe ca. 1.4 mm, narrowed in middle, corona of 5 lobes connate at base, borne at the base of the stipe, tube ca. 0.1 mm long, lobes deltate with acute tips, ca. 0.6 × 0.4 mm, arching outward toward corolla tube and then back toward gynostegium, with the tips touching the stipe about a quarter of the way up, terminal anther appendages ovate, ca. 0.25 × 0.25 mm, arching over style apex; anthers trapezoidal in outline, ca. 0.35 × 0.5 mm, guide rails ca. 45° from vertical, straight, ca. 0.25 mm long; pollinaria pendent, corpusculum ellipsoid, ca. 0.17 × 0.08 mm, red-brown, translators ca. 0.05 mm, thin, round in cross section, straight, pollinia narrowly ellipsoid, ca. 0.23 × 0.05 mm; style flat, 0.6 mm wide. Follicles and seeds unknown.

This new species, known only from the type, collected in cloud forest in Chiapas, Mexico, shares the caducous leaves, inflated anther backs, coronal structure and size, and general pollinaria characteristics with *Orthosia ramosa*, but has corolla lobes about as long as the tube, instead of half as long, a stipe about three times longer than that of *O. ramosa* and a more strongly conical gynostegium.

Acknowledgments. Fred Keusenkothen and Brigham Fisher prepared the images. Amy Pool improved the manuscript in many ways, especially in reining in rhetorical excesses. The assiduous editors of Novon took care of the rest.

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Johnstonia, a New Genus of Gouanieae (Rhamnaceae) from Peru

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Abstract. A new genus, *Johnstonia* (Rhamnaceae, Gouanieae), is proposed for *Gouania axilliflora* M. C. Johnston, a species from Peru affined to *Alvimiantha* Grey-Wilson and *Reissekia* Endlicher, from which it differs by the sessile paired flowers in the axil of leaves; it is also distinct from *Alvimiantha* by the entire mericarps. The new combination *Johnstonia axilliflora* (M. C. Johnston) Tortosa is made.

Resumen. Se propone un nuevo género, *Johnstonia* (Rhamnaceae, Gouanieae), para *Gouania axilliflora* M. C. Johnston, una especie de Perú afín a *Alvimiantha* Grey-Wilson and *Reissekia* Endlicher, de los cuales se diferencia por las flores geminadas sésiles en la axila de las hojas; también se distingue de *Alvimiantha* por los mericarpios enteros. Se establece la nueva combinación *Johnstonia axilliflora* (M. C. Johnston) Tortosa.

Key words: Gouanieae, *Johnstonia*, Peru, Rhamnaceae.

The tribe Gouanieae Reissek of the family Rhamnaceae groups genera with inferior ovary, generally with winged fruits (Suessenguth, 1953). One of its genera, *Gouania* Jacquin, has a wide distribution area in America (from Florida (U.S.A.) and northern Mexico to Bolivia, Paraguay, and northeastern Argentina and Uruguay), Africa, Asia, Australia, and Oceania. Its species are climbers with short shoots ending in a tendril, spike-like inflorescences, flowers with a disk with conspicuous free lobules opposite to the sepals, and winged fruits that divide into three mericarps, each sustained by two carpophore bundles.

Gouania axilliflora M. C. Johnston, proposed by Johnston (1988) for a Peruvian plant, differs from *Gouania* in the absence of tendril-shoots, absence of floral disk lobules, and in the inflorescences formed by sessile flowers paired in the axil of leaves. In the first two characters it matches two other South American genera of Gouanieae, *Alvimiantha* Grey-Wilson and *Reissekia* Endlicher, both monotypic genera from the east of Brazil, with pedunculated umbellate-cymose inflorescences.

The unique characters of the Peruvian species, lead us to erect a new genus.

Johnstonia Tortosa, gen. nov. TYPE: *Johnstonia axilliflora* (M. C. Johnston) Tortosa.

Rhamnacearum, a genere *Gouaniam* lobulis disci carentibus, floribus geminis ad axillam foliorum, absentia ramulorum in capreolos terminantes differt; *Alvimianthae* et *Reissekiae* affinis, sed floribus geminatis sessilibus ab eis recedens, ab *Alvimiantha* differt mericarpiis integris.

Climbers with tendrils in the flowering branches. Leaves sparse, elliptic, entire, 3-nerved, petiolate. Flowers in axillary, sessile, 2-flowered inflorescences. Floral tube hemispherical; sepals 5, triangular, externally pubescent; petals 5, concave; stamens 5, with the anthers hooded by the petals; disk flat, unlobed; ovary inferior, trilocular, with solitary ovules in each loculus, style 3-branched, stigmas club-shaped. Fruit schizocarp, giving rise to three winged mericarps.

The genus is named in honor of Marshal C. Johnston, who has clarified the taxonomy of many genera of Rhamnaceae from America.

1. Johnstonia axilliflora (M. C. Johnston) Tortosa, comb. nov. Basionym: *Gouania axilliflora* M. C. Johnston, Syst. Bot. 13: 493. 1988. TYPE: Peru. Department of Cajamarca, Province of Cajabamba, Condebamba valley, Cajabamba–Cajamarca road, 15 Feb. 1983, *D. N. Smith & R. Vásquez M. 3396* (holotype, TEX; isotypes (not seen) AMAZ, CPUN, HUT, MO, USM).

When Johnston (1988) proposed *Gouania axilliflora* M. C. Johnston for a Peruvian plant, he stated that in habit, foliage, and structure of the flowers the new species is closely related to *Alvimiantha tricamerata* Grey-Wilson, characterized by its flowers arranged in a pedunculate 2- to 7-flowered congested cyme and by its winged seeds. He considered that the characters used for recognition of the genera in the tribe Gouanieae were so weak that he rejected the alternative of erecting a genus for the new species. Therefore, he discussed the possibility

of including *Alvimiantha* within *Gouania* near *G. axilliflora*, but considered that much field and laboratory study was necessary before such a decision.

Medan (1989) described the structure of the fruits of the genera *Alvimiantha* and *Gouania*, both with a 3-seeded schizocarp, with winged diaspores. He showed that in the genus *Gouania*, when fruits ripen, the three carpels separate along the planes of the septa, and each mericarp hangs down from the detached marginal bundles. Further, the wings of the diaspores (mericarps) represent pericarp outgrowths of the commissural areas of adjacent carpels. In *Alvimiantha*, the fruits also undergo carpellary separation along the planes of the septa with the detachment of marginal bundles, but a tangential splitting of the pericarp wall occurs, giving rise to an outer coriaceous valve and a winged diaspore (with a wingless seed included), confounded by Grey-Wilson with a winged seed (Grey-Wilson, 1978: 290, figs. H, J, K). The fruits of *Johnstonia axilliflora* conform with those of *Gouania* (Fig. 1D).

Johnstonia and *Gouania* differ in their habit. *Gouania* bears serial buds in the leaf axils of orthotropic shoots (erect axis, with radial symmetry, negatively geotropic) (Cremer, 1974; Tourn et al., 1991); the distal bud of the axillary complex gives rise to a tendril shoot (Fig. 1A, B, ts). These tendril shoots have determinate growth and generally bear 2 prophylls (Fig. 1B, p) and a foliage leaf, in the axil of which develop a tendril (Fig. 1B, t) and a spike-like inflorescence (Fig. 1B, r) (Tourn et al., 1991). Tendrils may also occur in the axis of the inflorescences (Fig. 1B, t_1; see also illustration of *G. latifolia* Reissek, in Reissek, 1861, tab. 36). In *Johnstonia axilliflora*, tendrils (Fig. 1C, t) occur only at the nodes of plagiotropic shoots (axis ± horizontal, with dorsiventral symmetry) (Fig. 1C, ps; see also Johnston, 1988: 494, fig. 1, a); serial buds and tendril-shoots are lacking. *Alvimiantha* and *Reissekia* correspond in this aspect of habit to *Johnstonia* (Fig. 1E; see also Grey-Wilson, 1978: 290, fig. 1, and Reissek, 1861, tab. 40, respectively).

Inflorescences in *Gouania* are spike-like racemes (Fig. 1B, r, r_1), in *Johnstonia* 2-flowered glomerules (Fig. 1C, g), and in *Alvimiantha* and *Reissekia* pedunculated umbellate-cymes (Fig. 1E, u). In *Gouania* the disc of the flower is conspicuous with 5 elevated acuminate, obtuse, truncate or emarginate lobules, opposite to the sepals, while in *Alvimiantha*, *Johnstonia*, and *Reissekia* the floral disk is thin, flat, and unlobed.

All vegetative and reproductive characters place *Johnstonia axilliflora* near *Alvimiantha*, but the distinct trait of the fruit in the latter supports the decision to treat this species as belonging to a new genus.

Key to Genera of Gouanieae in America

1a. Climbers with tendrils.
  2a. Floral disc with conspicuous lobes opposite the sepals; tendril-shoots present; inflorescence a spike-like raceme . . . . . *Gouania*
  2b. Floral disc without lobes; tendril-shoots absent.
    3a. Leaves entire, 3-nerved.
      4a. Mericarps undivided; inflorescence a 2-flowered glomerule . . . *Johnstonia*
      4b. Mericarps splitting in an outer coriaceous valve and a winged diaspore; inflorescence a pedunculated umbellate-cyme . . . . . *Alvimiantha*
    3b. Leaves finely serrate, pinnately nerved (obscurely 3-nerved); inflorescence a pedunculated umbellate-cyme . . *Reissekia*
1b. Perennial, erect or annual, decumbent herbs . . . . . *Crumenaria* Martius

Representative specimens examined. ***Alvimiantha.*** *A. tricamerata* Grey-Wilson: BRAZIL. 28 km NW of Lagoinha (which is 5.5 km SW of Delfino) on side road to Minas do Mimoso, Caatinga, *R. M. Harley 16890* (photos of isotypes MO, NY). ***Gouania.*** *G. adenophora* Pilger: BOLIVIA. **Pando:** Madre de Dios, Prov. Barranco de Puerto Candelaria, 140 m s.m., 19–VIII–1985, *Moraes 228* (LPB, NY). *G. aptera* DC.: PERU. **Amazonas:** Luya, Camporredondo, 18–VI–1999, *Campos 6037* (BAA). *G. latifolia* Reissek: BOLIVIA. **Santa Cruz:** Prov. Florida, 5 km (by road), 3 km (by air) NE of Bermejo, along petroleum pipeline and old horse road to Santa Cruz, 17–VII–1987, *Nee & Coimbra S. 35252* (LPB, MO, NY). *G. longipetala* Hemsley: CAMEROON. Bipinde, X–1913, *G. Gaubay 402* (SI). *G. longispicata* Engler: RHODESIA. Nyassa, Hochland, Station Kymbila, 1911, *A. Stolz 901* (SI). *G. lupuloides* (L.) Urban.: U.S.A. **Florida:** Indian River Region, 27–X–1902, *C. Brevard* (SI); ARGENTINA. **Misiones:** Iguazú, Cataratas del Iguazú, Balcón Salto Brasileños, 30–VII–1979, *Tortosa et al. 124* (BAA). *G. microcarpa* DC.: PHILIPPINES. **Luzon:** Prov. Rizal, XII–1909, *M. Ramos 96* (SI). *G. polygama* (Jacquin) Urban: BOLIVIA. Prov. Nor Yungas, 16.5 km NE of Chuspipata,13.6 km SW of Yolosa, 3–IV–1984, *Solomon & Uehling 12148* (MO). *G. trichodonta* Reissek: BOLIVIA. **Pando**: Prov. F. Román, Río Negro por el Río Negro, 120 m s.m., 17–VI–1987, *Solomon 17089* (MO). *G. ulmifolia* Hooker: PARAGUAY. **Alto Paraná**: Escuela Técnica Forestal, Pto. Pte. Stroessner, km 12, 01–1982, *Fernández Casas 5656* (G, MO); BRAZIL. **Parana:** Ponta Grossa, 13–II–1911, *P. Dressen* (SI).

Acknowledgments. The author gratefully acknowledges the assistance of B. L. Turner for making accessible material of the holotype of *G. axilliflora* M. C. Johnston; Marshal C. Johnston and an anonymous reviewer for critical comments; Victoria C. Hollowell for editorial advice; and Universidad de Buenos Aires for financial support.

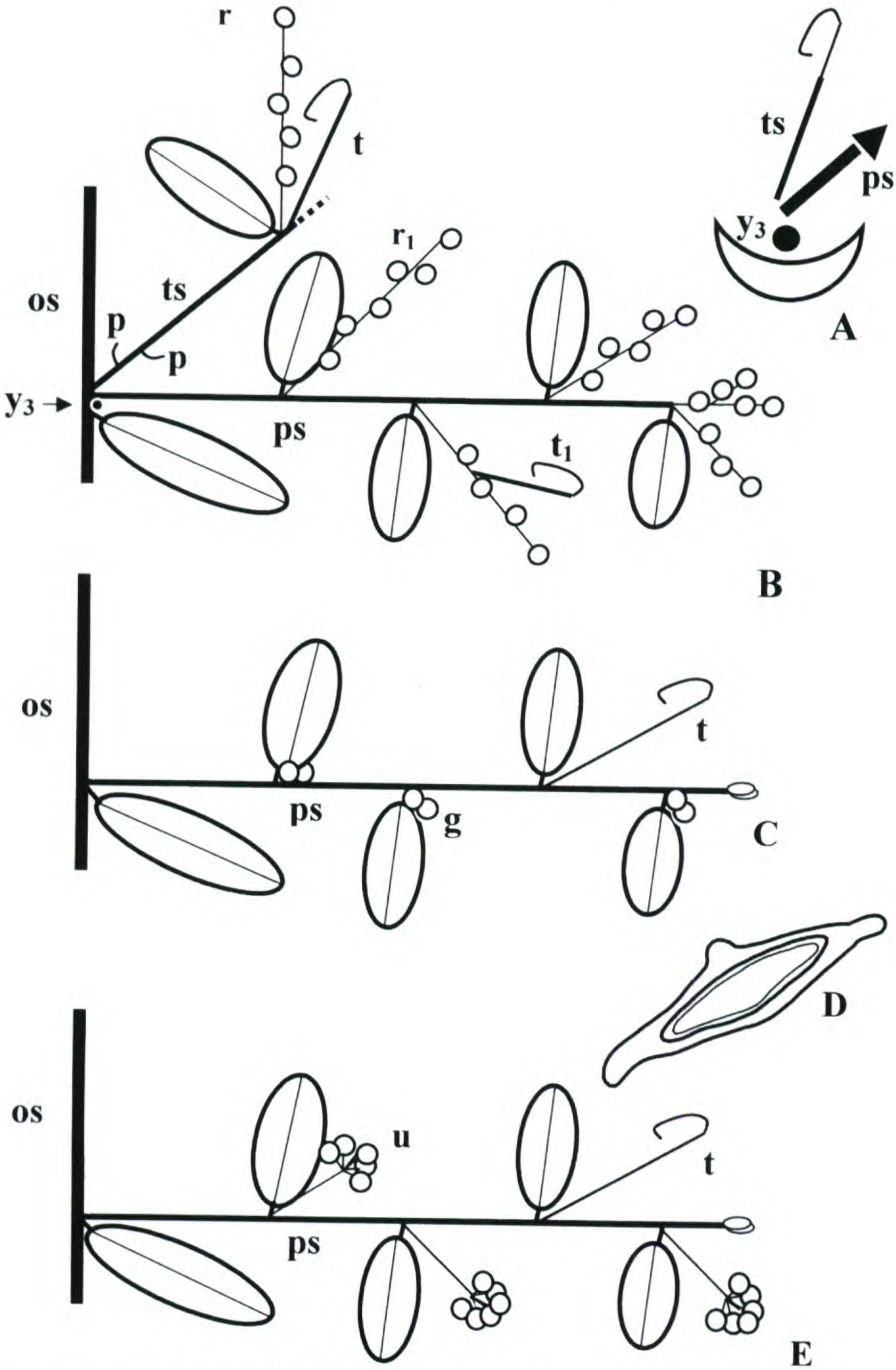

Figure 1. A, B, *Gouania.*—A. Axillary complex. —B. Vegetative and reproductive structures at a node. C, D, *Johnstonia axilliflora.*—C. Vegetative and reproductive structures at a node. —D. Cross section of a mericarp (from *Smith & Vásquez 3396,* holotype, TEX). —E. *Alvimiantha tricamerata.* Vegetative and reproductive structures at a node. References: **g,** 2-flowered glomerule; **os,** orthotropic shoot; **p,** prophyll; **ps,** plagiotropic shoot; **r** and $\mathbf{r_1}$, spike-like raceme; **t** and $\mathbf{t_1}$, tendril; **ts,** tendril shoot; **u,** umbellate-pedunculate inflorescence; $\mathbf{y_3}$, dormant proximal bud.

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Two New Species of *Senecio* (Asteraceae, Senecioneae) from Argentina

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Abstract. Two new species of *Senecio* L. from Argentina, *S. fragrantissimus* and *S. pumilus*, are described and illustrated. Both species belong to *Senecio* ser. *Xerosenecio* (Cabrera) Cabrera & S. E. Freire and are allied to *S. filaginoides* DC., from which *S. fragrantissimus* differs by its ascending branches with needle-like leaves crowded along the stems, and *S. pumilus* diverges by its dwarf cushion-like habit and elliptic, thicker leaves. A key is included to those species affined to *S. filaginoides*.

Resumen. Se describen e ilustran dos nuevas especies de *Senecio* L. de Argentina, *S. fragrantissimus* y *S. pumilus*. Ambas pertenecen a *Senecio* serie *Xerosenecio* (Cabrera) Cabrera & S. E. Freire y son afines a *S. filaginoides* DC., de la cual *S. fragrantissimus* difiere por sus ramas ascendentes con hojas aciculares aglomeradas a lo largo de las ramas, y *S. pumilus* diverge por formar cojines con hojas elípticas más crasas. Se incluye una clave para las especies afines a *S. filaginoides*.

Key words: Argentina, Asteraceae, Compositae, *Senecio*.

The series *Xerosenecio* (Cabrera) Cabrera & S. E. Freire of the genus *Senecio* L. sect. *Senecio* (sensu Cabrera et al., 1999) is characterized by a ligneous habit and discoid capitula disposed in terminal corymbs. Cabrera (1949) and Cabrera et al. (1999) included 39 species in this series, distributed in Argentina and Chile, with only one species (*S. vira-vira* Hieronymus) also in Uruguay and in southeastern Brazil in the state of Rio Grande do Sul.

During a taxonomic revision of *Senecio* ser. *Xerosenecio*, we found two new species from Argentina, both affined to *Senecio filaginoides* DC. by their woolly stems, leaves, and phyllaries, and by their narrowly cylindric or obconical involucres, less than 8 mm high, composed of 10 to 14 phyllaries.

Senecio fragrantissimus Tortosa & A. Bartoli, sp. nov. TYPE: Argentina. San Luis: Pringles, Saladillo, "Flores color crema, perfumadas," 9 Nov. 1940, *G. Covas 1337* (holotype, LP). Figure 1.

Affinis *Senecioni filaginoidi* DC. sed ramis hornotinis ascendentibus foliis acicularis congestis notabilis differt.

Shrub 50–80 cm, mostly ramified from the base, lanuginose or sublanuginose on stems, leaves, and phyllaries; stems ascending with very short internodes from midstem upward. Leaves alternate, sessile, acicular, ± spreading, 0.9–3.5 × 0.04–0.06 cm, margin revolute, lanuginose or sublanuginose on both surfaces. Capitula pedunculate, arranged 5 to 15 in terminal corymbs; peduncles 0.5–1.3 cm long, involucre calyculate, cylindric, 6–8 × 2.5–3 mm; phyllaries 10 to 12, linear ovate, 6–8 × ca. 1 mm, dorsally lanuginose or sparsely lanuginose, apex acuminate with a tuft of short trichomes; calycular bracts ca. 4, linear, ca. 1.5 mm long, dorsally lanuginose. Disc florets 22 to 25, hermaphroditic, corolla cream, tubular, 5-lobed, 7–7.5 mm long, glabrous, basally broadened, limb slightly broader than the tube and not markedly distinct, lobes narrowly triangular, ca. 0.6 mm long, at base 0.3 mm wide; anthers minutely tailed, ca. 2–2.5 mm long; filament collars spatulate ca. 0.5 mm long; apical anther appendage obovate, ca. 0.4 mm long; basal tails ca. 0.15 mm long. Style branches ca. 1.5 mm long. Achenes cylindric, pubescent, ca. 3 mm, costate; pappus bristles many, slender, barbellate, 7–8 mm long, whitish.

Distribution and habitat. *Senecio fragrantissimus* is known only from two neighboring localities in the political province of San Luis of western Argentina, in xerophytic habitats with sandy soil at 800 m.

Figure 1. *Senecio fragrantissimus* Tortosa & A. Bartoli. —A. Habit. —B. Capitulum. Drawn from the type, *G. Covas 1337* (LP).

Etymology. The specific epithet makes reference to the fragance to which all collectors of this species alluded.

Senecio fragantissimus is allied to *S. filaginoides*, a species with a wide distribution in Argentina (Cabrera et al., 1999). The new species differs from the latter by its needle-like leaves, crowded together due to congestion of the upper stem internodes,

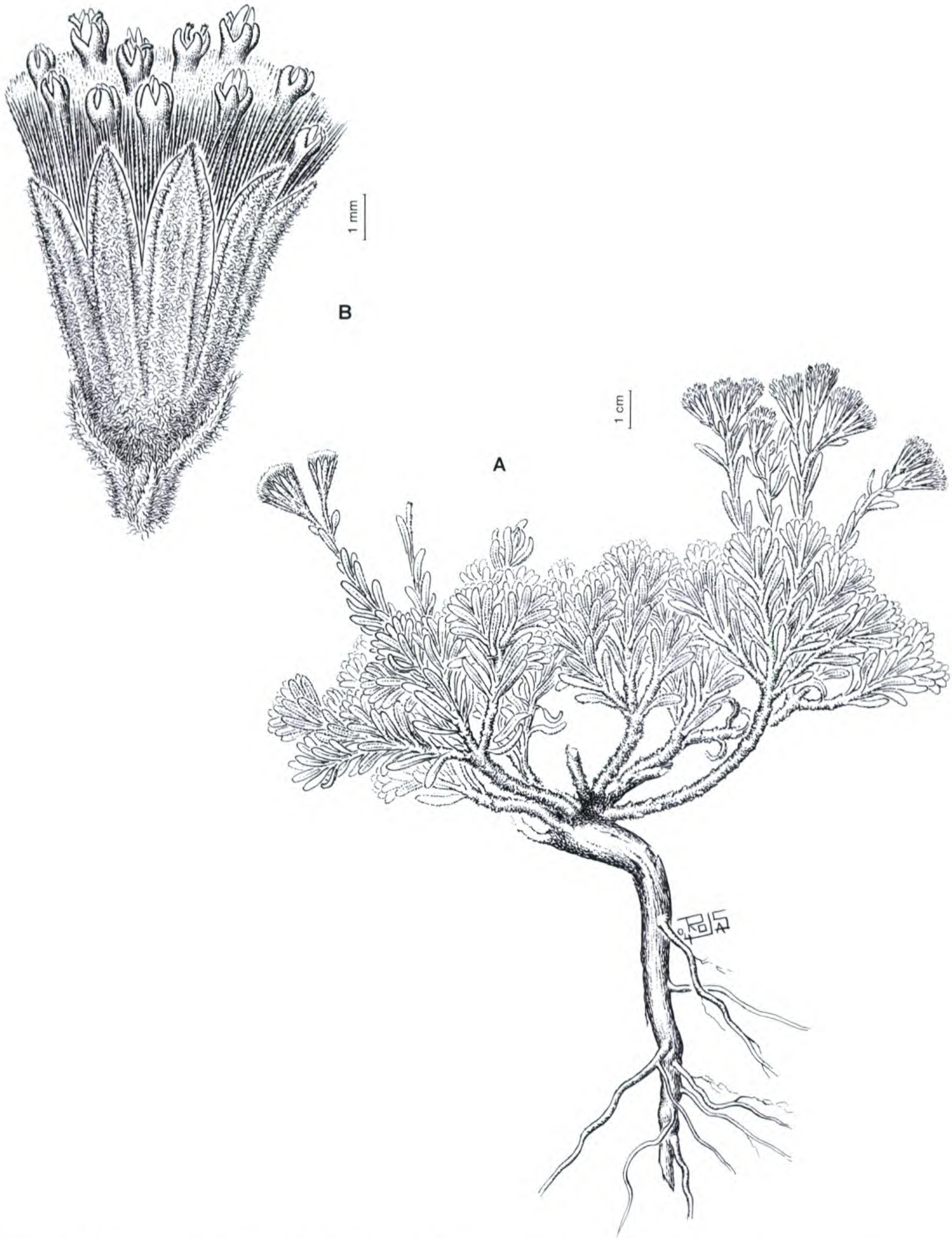

Figure 2. *Senecio pumilus* Tortosa & A. Bartoli. —A. Habit. —B. Capitulum. Drawn from the type, *E. Ancibor y H. Schwabe s.n.* (BAA 5789).

giving the branches and their foliage a cylindrical appearance. A similar aspect may be seen in some specimens of *S. bracteolatus* Hooker & Arnott (*O. Boelcke 4289* (BAA), *A. Havrylencco 6* and *7* (BAA), *Vallerini 339* (BAA)), but this species is glabrous and its heads have a campanulate involucre.

Paratypes. ARGENTINA. **San Luis:** Pringles, Saladillo, 9 Nov. 1940, *A. Burkart* (LP); 9 Nov. 1940, *G. Covas 1001* (LP); General Pedernera, al pié del Cerro El Morro.

cerca de la Ea. La Morena, 18 Oct. 1951, *A. T. Hunziker 9287* (LP).

Senecio pumilus Tortosa & A. Bartoli, sp. nov. TYPE: Argentina. Mendoza: Malargüe, Portezuelo del Choique, 2400 m s.m., 12 Mar. 1967, *E. Ancibor & H. Schwabe s.n.* (holotype, BAA 5789). Figure 2.

Inter species seriei *Xeroseneciones* indumento lanato, capitulis parvis in corymbis dispositis, involucro angusto ad *S. filaginoidem* DC. accedens sed statura minore, foliis ellipticis crassioribus involucro obconico ab ea recedens.

Dwarf shrubs 8–30 cm, much branched at the base, stems, leaves, and phyllaries densely whitish lanuginose; stems prostrate subligneous giving rise at their nodes to herbaceous ascending shoots. Leaves alternate, sessile, 0.8–2 × 0.15–0.30 cm, elliptic, obtuse or rounded at the apex, margin revolute, densely lanuginose on both surfaces. Capitula pedunculate, peduncles 0.5–1.5 cm long, arranged 3 to 6 in terminal corymbs; involucre calyculate, obconical, 6–7 × 3–3.5 mm; phyllaries 8 to 12, 6–7 × 1–1.2 mm, dorsally lanuginose, apex acuminate with short trichomes; calycular bracts ca. 5, elliptic, ca. 1–1.5 mm long, dorsally lanuginose. Disc florets ca. 20 to 24, hermaphroditic, corolla yellow, tubular, 6–6.5 mm long, glabrous, basally broadened, narrowly campanulate, lobes triangular, ca. 0.5 mm long, at base 0.3 mm wide; anthers minutely tailed, 2–2.5 mm long; filament collars spatulate, ca. 0.25 mm long; apical anther appendages deltoid, ca. 0.3 mm long; the basal tails ca. 0.1 mm long. Style branches ca. 1.2 mm long. Achenes cylindric, glabrous, ca. 3.5 mm, costate. Pappus bristles many, slender, barbellate, ca. 6 mm long, whitish.

The heads of *Senecio pumilus* are similar to those of *S. filaginoides*, but its dwarf cushion-shaped habit, not taller than 30 cm (vs. erect, 0.5–1 m tall in *S. filaginoides*), its elliptic, entire, thicker leaves (vs. linear to linear-elliptic in *S. filaginoides*), and its obconical involucre (vs. cylindric in *S. filaginoides*) distinguish the new species.

Distribution and habitat. *Senecio pumilus* has been found in the eastern Mendoza and Neuquén in Argentina, at elevations of 1900–2500 m of the Andes Mountains, an arid region with cool weather exposed to strong winds.

Etymology. The specific epithet makes reference to the habit of the species.

Paratypes. ARGENTINA. **Mendoza:** Malargüe, Portezuelo del Choique, *E. Ancibor & H. Schwabe s.n.* (BAA 5784); Ca. Portezuelo del Choique, *J. H. Hunziker 6381* (BAB); Malargüe, *A. Burkart, N. S. Troncoso & E. G. Nicora s.n.* (SI 14338); Cerros al N de Calmuco, *A. Burkart s.n.* (SI 14330); Laguna Coipo-Leuquen, al S de Calmuco, *A. Burkart, N. S. Troncoso & E. G. Nicora s.n.* (SI 14340); 6 km N de Calmuco, *G. Covas 412* (LP); Entre Calmuco y Pto. Los Colgados, *A. Prina, G. Alfonso & W. Muiño 1870* (SRFA); in montanis Valle del Yeso, *Gerling s.n.* (LP). **Neuquén:** Minas, Cordillera del Viento, arroyo Dos Puentes, *F. Pastore 3* (SI).

Key to Species Allied to *Senecio filaginoides*

1a. Leaves acicular, less than 0.6 mm wide . . . . . *Senecio fragrantissimus* Tortosa & A. Bartoli
1b. Leaves linear or elliptic, 1.5–3 mm wide.
  2a. Phyllaries 7 to 8; florets 10 to 12 . . . . . *Senecio pycnanthus* Philippi
  2b. Phyllaries 10 to 14; florets 18 to 26.
    3a. Shrubs 0.08–0.30 m high; leaves elliptic, entire; involucre obconical . . . . *Senecio pumilus* Tortosa & A. Bartoli
    3b. Shrubs 0.5–1 m high; leaves linear or linear-elliptic, entire, toothed or lobed; involucre cylindrical . . . . . *Senecio filaginoides* DC.

Acknowledgments. We thank the anonymous reviewers and Victoria C. Hollowell for reviewing the manuscript and for useful comments. We also acknowledge the assistance of the curators of BAB, LP, SI, and SRFA that made this study possible. Thanks to the artist, Francisco Rojas, for the drawings. This study was supported by the Universidad de Buenos Aires.

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Clematis erectisepala (Ranunculaceae), a New Species from Eastern Tibet, China

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ABSTRACT. *Clematis erectisepala*, a new species of Ranunculaceae collected from Yanjing Village of Markam County in eastern Tibet, is described and illustrated. It is distinguished from other *Clematis* by its nodding yellow flowers with erect sepals and glabrous stamens. This new species is similar to *C. brevicaudata* DC. vegetatively, but differs from the latter in floral structure.

Key words: China, *Clematis*, eastern Tibet, Ranunculaceae.

Clematis L., containing about 300 species, is one of the largest genera in Ranunculaceae (Wang, 1998). It is distinguished from other genera of the family by woody climbing stems (for most *Clematis* species) and opposite leaves. The genus *Clematis*, widely distributed in all continents except Antarctica, exhibits significant diversification in the Hengduan Mountains (western Sichuan, eastern Tibet, and western Yunnan provinces in China). Linnaeus (1753) first described nine species of *Clematis* in his great work *Species Plantarum*. The genus as delimited by Candolle (1818) has been accepted as a natural group. Prantl's (1888) classification of *Clematis*, with minor changes and additions, has been generally accepted until today. Recently, increasing attention has been paid to *Clematis* due to its great horticultural value (Tamura, 1995; Johnson, 1997; Grey-Wilson, 2000). In the summer and autumn of 2003, an extensive field investigation was conducted in the Hengduan Mountains. Based on thorough examination and identification of the specimens of *Clematis* collected during the exploration and their comparison to the specimens deposited in PE and KUN, a new species was recognized as *Clematis erectisepala* L. Xie, J. H. Shi & L. Q. Li.

Clematis erectisepala L. Xie, J. H. Shi & L. Q. Li, sp. nov. TYPE: China. Tibet: Markam County, Yanjing Village, climbing shrubs along the roadside, ca. 2650 m, 29°02′33″N, 95°45′87″E, 31 Aug. 2003, *L. Xie YJ01* (holotype, PE; isotypes, MO, PE [2]). Figures 1, 2.

Haec species *C. brevicaudatae* DC. affinis, sed ab ea floribus nutantibus atque calyce campanulato ex sepalis luteis erectis constante differt.

Woody vines; branches shallowly 6-grooved, sparsely puberulous. Leaves mostly ternate at upper nodes, with some bi-ternate and pinnate leaves at lower nodes; petioles 30–50 mm; leaflet blades papery, ovate or narrowly ovate, 21–30 × 12–22 mm, 3-lobed or undivided, both surfaces glabrous, margin coarsely dentate or entire or denticulate, base truncate or broadly cuneate, rarely rounded; apex acuminate or caudate; basal veins abaxially slightly prominent. Cymes terminal and axillary, 3- to many-flowered, often panicle-like; peduncle 6–10 cm, sparsely appressed puberulous; bracts opposite, subsessile, narrowly ovate to lanceolate, 4–13 mm long, 2–4 mm wide. Pedicel 5–10 mm, puberulous; calyx campanulate, 10 mm diam.; sepals 4, yellow, erect, oblong, 10 mm long, 3–4 mm wide, margin abaxially velutinous, apex acute and recurred; stamens numerous, 8–10 mm long, filaments linear, glabrous, anthers narrowly oblong, 2–3 mm, glabrous, apex obtuse; ovary puberulous; style 5 mm, densely villous. Fruit not seen.

Pollen grain prolate spheroidal (20 × 15 μm), tricolpate; colpi long, thin, running from pole to pole; exine bears a perforate tectum with microechinate ornamentation (Figure 2A–C).

The shapes of leaf epidermis cells are irregular on both the adaxial and abaxial blade surfaces, with stomata only appearing abaxially. The stomatal apparatuses are all anomocytic. The outlines of the guard cell pairs are suborbiculate, and the rims are

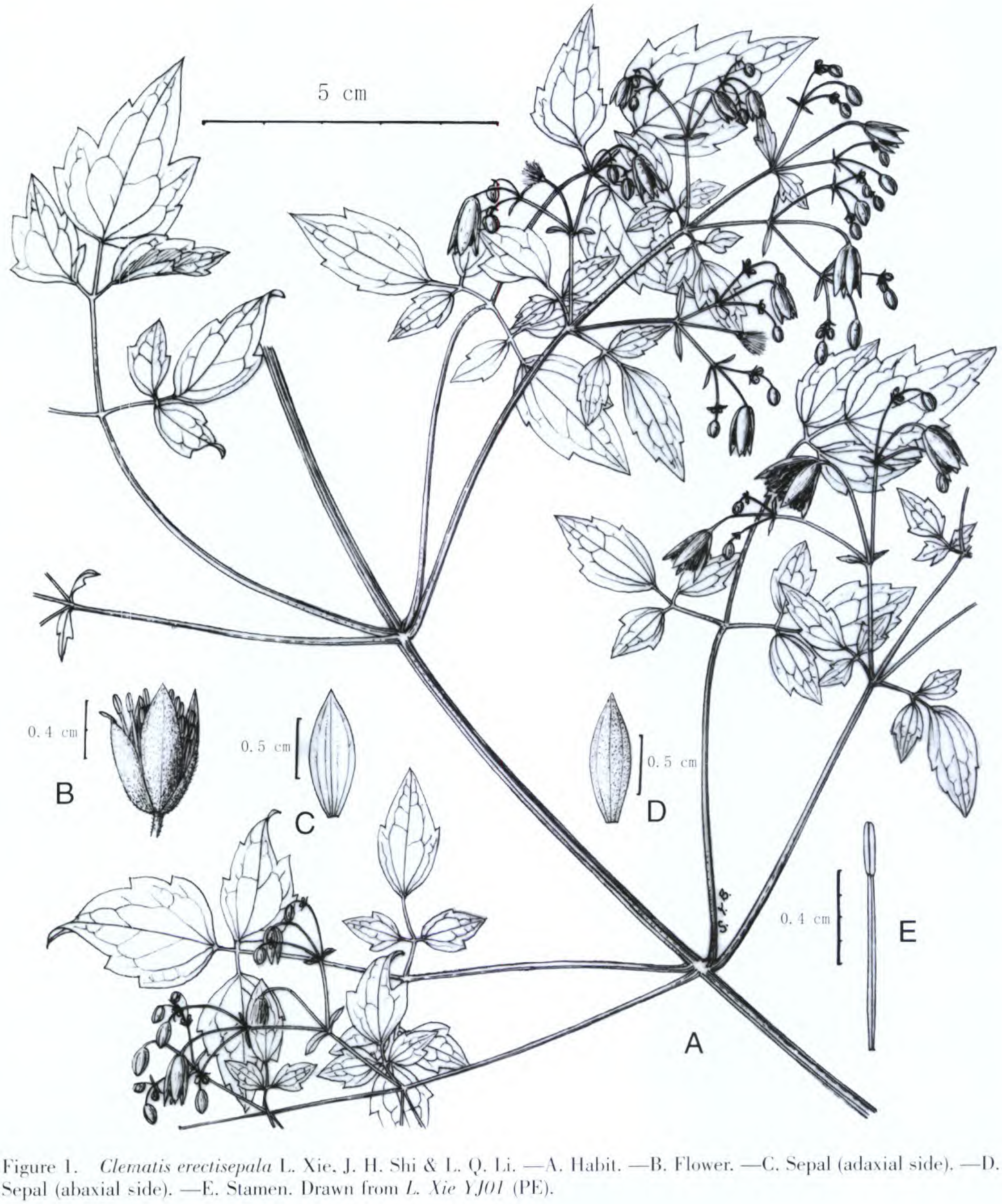


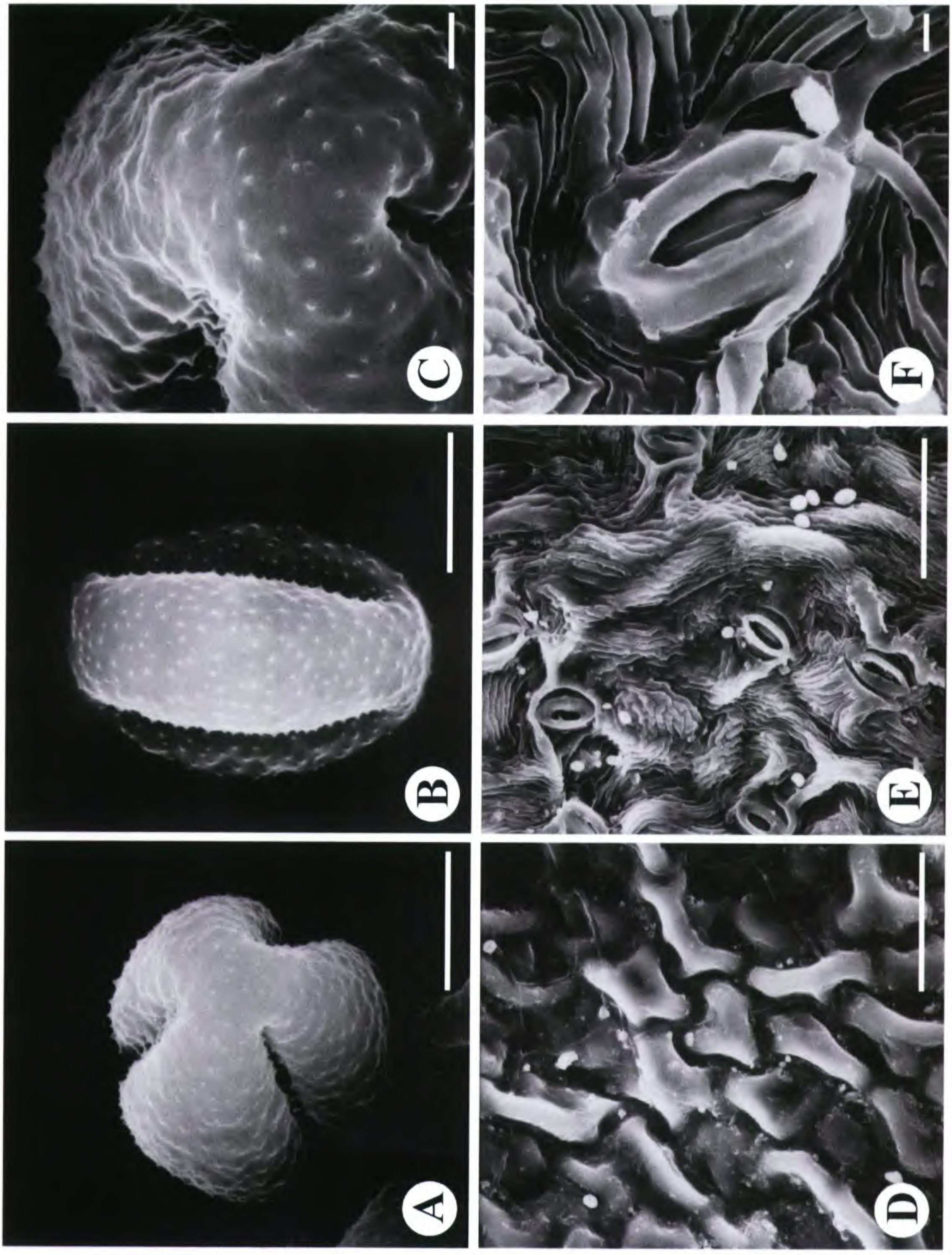
Figure 1. *Clematis erectisepala* L. Xie, J. H. Shi & L. Q. Li. —A. Habit. —B. Flower. —C. Sepal (adaxial side). —D. Sepal (abaxial side). —E. Stamen. Drawn from *L. Xie YJ01* (PE).

almost at the same level with the epidermis. The wax ornamentation of the leaf cuticle is nearly smooth on the adaxial surface and heavily striated on the abaxial surface (Figure 2D–F).

Distribution. Endemic to the Hengduan mountains in China, it has been recorded so far from only four counties: Nanping County, Barkam County (Sichuan Province); Yanjing County (Tibet Autonomous Region); and Dêqên County (Yunnan Province). It has been found at 1500–2700 m elevation.

Flowering and fruiting. Flowering time August to September; fruit not seen.

Ecology. The new species is found in the edge of Yanjing Village, which is located in Me Kong River valley at an altitude of 2650 m. It scrambles up shrubs of *Rosa* L. and is associated with *Cle-*


A
B
C
D
E
F

matis rehderiana Craib and *C. akebioides* (Maximowicz) Veitch, which are two common *Clematis* in the Hengduan Mountains.

Etymology. The species epithet refers to the erect sepals of this species; most *Clematis* with glabrous stamens have spreading sepals.

Clematis erectisepala L. Xie, J. H. Shi & L. Q. Li is allied to *Clematis brevicaudata* DC. by its habit, inflorescence type, leaf shape, and other vegetative characters. However, the new species differs by floral structure: the sepals are yellow, erect and the flowers are bell-shaped and always nodding. The new species is often misidentified as *C. peterea* Handel-Mazzetti and *C. brevicaudata* DC. by its leaf shape and glabrous stamens.

Paratypes. CHINA. **Sichuan:** Nanping County, river valley, alt. 1500 m, 7 Aug. 1983, *Z. X. Tang 1648* (PE); Barkam County, river valley, alt. 2650 m, 3 Aug. 1977, *Anonym 23328* (PE). **Tibet:** Yanjing County, river valley, alt. 2700, *Comprehensive exploration team 76–767* (PE). **Yunnan:** Dêqên County, river valley, alt. 2100 m, 25 Aug. 1981, *Y. F. Han, K. M. Deng & Y. R. Chen 81–1795* (PE).

Acknowledgments. We express our thanks to Prof. W. T. Wang for his invaluable advice on the manuscript. We are indebted to Y. H. Xiao and X. J. Yang for their assistance on the SEM experiments and film development. We are also grateful to Y. B. Sun for the drawing. This work was supported by the National Natural Science Foundation of China (Grant No. 30470126).

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Figure 2. *Clematis erectisepala* L. Xie, J. H. Shi & L. Q. Li. Scanning electron photomicrographs of pollen grains (A–C). —A. Polar view. —B. Equatorial view. —C. Pollen exine details. Scale bar = 7.5 μm. Scanning electron photomicrographs of leaf epidermis (D–F). —D. Adaxial epidermis. —E. Abaxial epidermis. —F. Stomatal apparatus. Scale bar = 50 μm.

Volume 15, Number 1, pp. 1–252 of NOVON was published on 29 April 2005.
Volume 15, Number 2, pp. 253–384 of NOVON was published on 13 July 2005.
Volume 15, Number 3, pp. 385–502 of NOVON was published on 21 September 2005.
Volume 15, Number 4, pp. 503–654 of NOVON was published on 12 December 2005.